Digital Technology to Support the Work It Out Program

A report on the Indigenous Health Portal Project

Project ID 71075

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This project was generously funded by Queensland Health.
Executive summary

In July 2014, The Department of Science, Information Technology, Innovation and the Arts (DSITIA), in partnership with PricewaterhouseCoopers (PwC), launched the Innovation Hub Pilot Project to provide Queensland Government with a new way to solve complex problems. Departments of Queensland Government identified four problems that were reasonably achievable to solve and four problem statements were developed requiring innovative solutions using the ideas of private and public sector experts. Queensland Health submitted the following problem for the Innovation Hub Pilot Project:

**Indigenous Health –**

*it is hard for Indigenous Australians living in remote communities to recognise their cardiovascular risks and to identify accessible and relevant options to improve their health.*

CSIRO had expertise in secondary preventative management of cardiac health through recent development and validation of an innovative mobile health program for cardiac rehabilitation. This expertise, coupled with experience in Indigenous engagement, saw CSIRO selected from the Innovation hub finalists and entered into a 12 week incubation period to refine a solution to the Indigenous cardiac health problem.

To tailor the program and ensure its successful integration into an Indigenous community, as well as to be broadened to address prevention, modifications were made to several key components. This included: (i) the service delivery model encompassing program content, enrolment, the clinical portal and mentoring, (ii) the educational component consisting of videos and motivational messages, and (iii) the visual presentation of the app based health diary. The revised app was developed for android and iOS operating systems. The modifications were made through initial community engagement, engagement with Indigenous health providers, engagement with an Indigenous production company and in house software development consultation. With the customisations and the feedback received throughout the incubation period, the program was at an appropriate readiness format for community consultation and pilot trial.

Since 2009, the Institute for Urban Indigenous Health (IUIH) has made significant inroads into Aboriginal and Torres Strait Islander health through successful initiatives like Deadly Choices and the Work It Out (WIO) program. The mobile health program was considered to be a suitable complement for the WIO program. The relationship that IUIH and WIO had developed with Aboriginal and Torres Strait Islander people in metropolitan areas, over several years, facilitated CSIRO’s engagement with WIO participants to determine how the technology could meet their needs for tracking health-related factors. Following a consultative process, the tailored platform was trialled in two locations and in two phases, with the initial phase trialling a modified health diary and the second phase, covering both the health diary and a digitised health program. Results suggest that the technology is more appropriate for some participants than others. The results also suggest that participants were most interested in tracking those health measures that are directly related to the WIO program, such as blood pressure, heart rate and blood glucose. Participants reported that advantages of the health diary included a greater awareness of factors contributing to their health and the ability to show their GPs, accurate records of their health data, over specific timeframes.

This project demonstrated that it is possible to modify existing technologies to augment programs designed for Aboriginal and Torres Strait Islander adults managing chronic health conditions. By following appropriate cultural protocols that recognise the value of input from Aboriginal and Torres Strait Islander people themselves, and working closely with Indigenous health providers, Aboriginal and Torres Strait Islander adults were provided an opportunity to refine a technology to augment their existing health program to suit the needs of their chronic health journey.
Part I  Indigenous Health Portal Project

An overview of engagement, technology development and trial
Introduction

Aboriginal and Torres Strait Islander people are best positioned to receive positive health outcomes when health initiatives are led by Indigenous health providers. With the advent of digital health services, many health initiatives involve the use of technology. However, most technology-enabled services are designed for the general population (as a one-size-fits-all approach). To date, there have been few trials of culturally appropriate, health-related phone or portable technology apps for Aboriginal and Torres Strait Islander communities. As such, little is known about the effectiveness, accessibility and acceptability of this technology in this population. Two trials of mental health apps have been reported by researchers, both of which were developed with extensive community consultation; the AlMhi Stay Strong app (Dingwall et al., 2015), and the ibobbly suicide prevention app (Tighe et al., 2017, Shand et al., 2013). Whilst the use of apps was found to be both acceptable to the participants and feasible in reducing mental health symptoms, they were targeted only at Indigenous people aged 18-35 in rural and remote communities (Povey et al., 2016), which represents only a small portion of the Aboriginal and Torres Strait Islander population. Furthermore, while mental health has been found to be the largest contributor towards Indigenous burden of disease (Vos et al., 2009, Zhao & Dempsey, 2006), lifestyle factors, such as: smoking, physical inactivity and diet, contribute to increased rates of coronary heart disease (CHD) and diabetes. Both CHD and diabetes are largely responsible for the life expectancy gap present between Indigenous and non-Indigenous Australians (Vos et al., 2009; Zhao & Dempsey, 2006; Begg et al., 2014).

The Institute for Urban Indigenous Health (IUIH) was established in 2009 by four Aboriginal and Torres Strait Islander Community Controlled Health Services. IUIH leads the planning, development and delivery of comprehensive primary health care to Indigenous communities in South East Queensland (SEQ), Australia’s second largest but fastest growing Indigenous population. IUIH is improving access and health outcomes through expansion and reform of Community Controlled Health Services with a current regional network of 19 multidisciplinary primary health clinics, which service over 30,000 people. In order to facilitate further expansion of services, secure ongoing delivery of programs and increase community support networks, IUIH has developed strategic partnerships with mainstream health providers and institutions, including CSIRO, to achieve the goal of improved primary health care access for urban Aboriginal and Torres Strait Islander people in SEQ.

CSIRO’s Australian eHealth Research Centre (AEHRC), a Joint Venture with Queensland Health, has strong capability in developing platform technologies to facilitate and enhance eHealth services. One such technology is the first clinically validated mobile delivery of cardiac rehabilitation (CR) services through a platform technology comprising a clinical portal, and a CR information, mentoring and motivational program delivered through a smartphone app that included a health diary (Varnfield et al, 2012). Compared to traditional clinic-delivered services, the smartphone-delivered CR program improved uptake, adherence and completion rates of rehabilitation in CR patients, as well as performing equally or better in health outcomes (Varnfield et al., 2012). This technology was then modified in 2015 to address awareness of heart disease and increase access to services in Aboriginal communities (Bradford et al., 2015). As part of these modifications, AEHRC consulted with IUIH to incorporate the views of Indigenous health providers into the platform modifications. During these consultations it was determined that a similar mobile health platform could augment IUIH’s Work it Out (WIO) Program, a chronic disease self-management program conducted with metropolitan Aboriginal and Torres Strait Islander adults.

In this report we discuss the engagement process undertaken with the WIO program participants and staff to develop a culturally appropriate technology to augment the WIO program and enhance health autonomy in participants. We describe the modifications made following the engagement period, development of the digital program, and usage results from trials with WIO clients in Woolloongabba and the Gold Coast. This project has demonstrated that existing technology can be modified to align with needs and expectations of Aboriginal and Torres Strait Islander adults when self-managing their chronic health conditions, and can also be implemented into existing health programs.
1.1 Work It Out program

The WIO program is a self-management and rehabilitation program comprising exercise and education for Aboriginal and Torres Strait Islander people diagnosed with, or at risk of, chronic disease. It applies self-management concepts using a culturally responsive and holistic framework, and aims to empower and build confidence in participants to self-manage their health, enhance independent functioning, and improve physical and psychosocial health outcomes. In 2017, it was run at 14 sites across South East and Central Queensland. Each session runs for two hours, 2–4 times a week (site-dependant) with groups of 6–20 participants. The exercise component is held in a gym or swimming pool, and consists of individually-tailored exercises in a group setting prescribed and supervised by an exercise physiologist. The education component of the program is delivered by a range of allied health professionals including dietitians, psychologists, pharmacists, and occupational therapists, some of whom are Aboriginal and some are non-Indigenous. Each session ends with 15 minutes of tukka (sandwiches) in an informal and social setting. WIO runs in 12-week cycles throughout the year. Once a participant enters the program, they may continue attending consecutive cycles as long as desired, which caters for absences due to illness or cultural and/or family commitments. WIO participants are given continuous opportunity to provide both formal and informal feedback to program staff to ensure their perspectives are noted and incorporated into program structure, delivery, research and quality improvement. This enables transparency and facilitates trust, community ownership and determination.

1.2 Mobile health platform

The mobile health platform used to augment the WIO program comprises three elements – (i) the clinical portal which holds the participants’ data, (ii) the health program comprising multimedia health information and health devices and (iii) the smartphone app (iOS and Android) through which the program is delivered and which houses the health diary (Figure 1). Program components include multimedia material, motivational messages, mentoring and goal setting, and educational resources. The health diary is used to record metrics associated with lifestyle factors (alcohol, cigarettes, coffee, sleep, stress, steps, fruit and vegetables) and health metrics (blood pressure, heart rate, blood sugar, height, weight). Users can also enter data relating to exercise and symptoms.

![Health program comprising information, mentoring and motivational messages](modified from Varnfield et al., 2012)

Figure 1: The mobile health platform comprises the clinical portal, the health program with multimedia health information and health devices, and the smartphone app (modified from Varnfield et al., 2012).
2 Methods

This project was undertaken as a participatory design process heavily reliant on input from WIO clients and IUIH staff, together with researchers and software engineers from CSIRO. It was conducted as an amendment to an existing project, with approval from the University of Queensland’s Institutional Human Research Ethics Committee (2011001283) and reciprocal approval from CSIRO Health and Medical Human Research Ethics Committee (12/2016).

2.1 Participants and procedure

Engagement with two groups of WIO clients (Woolloongabba and Gold Coast) was conducted through a focus group format to allow yarning (an informal and conversational approach to sharing information and gathering thoughts, views and opinions in line with Aboriginal and Torres Strait Islander values). During yarning, the client facing component of the mobile health platform was introduced and demonstrated; and the platform as a whole was discussed in detail. Participants were not offered incentives, although a buffet-style lunch was provided following the engagement period (Figure 2).

![Figure 2: A healthy, buffet style lunch was provided for Work It Out clients at the end of the engagement period.](image)

Participating clients were consulted by researchers during a 12-week engagement period (April-June 2016) and two 12-week trial periods (July-Sept 2016 and January-March 2017). Through this engagement, researchers obtained perceptions and criticisms of the mobile health platform to inform modifications and improve applicability, particularly of the health app, for Aboriginal and Torres Strait Islander adults with chronic health conditions. The WIO program attracts both regular and ad hoc attendance and as such, some participants were consulted more often than others. In each location, up to 20 people attend the WIO program over the course of a cycle. All attending participants were eligible for the study and were included in yarning, with many of those who attended regularly (N=23) interested in trialling the platform in either or both of the two trials (Table 1). Three participants who were keen to trial the platform but did not own a mobile phone, or a compatible mobile phone, were given a smartphone to use for the trial, and keep once the trial concluded.
Table 1: Demographics of the Work It Out clients participating in the study.

<table>
<thead>
<tr>
<th>Participants (N=23)</th>
<th>Woolloongabba (n=8)</th>
<th>Gold Coast (n=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>61.9 (43–81)</td>
<td>62.7 (31–76)</td>
</tr>
<tr>
<td>Gender</td>
<td>F=4, M=4</td>
<td>F=11, M=4</td>
</tr>
<tr>
<td>Identify as Aboriginal or Torres Strait Islander</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td># with diagnosed chronic disease or condition</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td># with risk factors</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td># with compatible smartphone*</td>
<td>6</td>
<td>14</td>
</tr>
</tbody>
</table>

* Three participants were given smartphones so that they could participate.

The second group of participants comprised IUIH staff including exercise physiologists and those responsible for program development and design. A meeting with all exercise physiologists was held at the start of the engagement period to determine their requirements for modifications to the health diary and digital program. They were then given the opportunity to provide feedback of their thoughts and ideas over the initial 12-week engagement period. Ongoing engagement with the two exercise physiologists responsible for the relevant WIO sites as well as program development and design staff was conducted in an iterative process throughout the course of the ensuing trials.

The wireframes and user interface for the digital program were developed by the designers of the original WIO program workbook, together with IUIH and CSIRO staff. The timing coincided with preparations for a new version of the workbook. Hence the digital version reflected the most current information delivered through the WIO program.

Researchers included a project lead, with responsibility for overviewing the project, conducting introductory and final sessions with both client groups and regular sessions with the Gold Coast group, as well as leading the engagement with IUIH staff for the digital program; an industry placement student who conducted data collection during the first trial in both locations; software engineers who adapted the existing technology and developed the digital program from wireframes; and a consultant with strong Indigenous engagement experience who attended regular sessions with the Woolloongabba clients.

### 2.2 Trialling the suggested modifications

During the engagement period, health measures and exercise options pertinent to the participants were identified. These were incorporated into the platform design and development at the end of the engagement period. At the commencement of the subsequent WIO cycle, those participants who expressed interest in using the app (n=17) were given access to the app and instructions in its use. During this time, a digital version of the WIO education program and additional diary functions were developed and incorporated prior to the second trial conducted with predominantly Gold Coast clients (n=16) and one Woolloongabba client. Some of the clients ended their participation after the first trial, and some clients began participation in the second trial, hence the total number of participants (N=23) is greater than the number in each trial (n=17). Researchers regularly attended sessions during the two implementation trials to obtain feedback and assist with any technical or operative difficulties.

### 2.3 Project timeline

The periods in which key processes were undertaken including ethics, engagement, software development analysis, reporting and dissemination, are provided in the project timeline (Figure 3).
Figure 3: Key project activities were undertaken between April 2016 and June 2017. Final reporting to both QLD Health Community Funding and the Aboriginal and Torres Strait Islander Health Unit occurred at the start of financial year 2017/18 with a further conference presentation in November 2017. *Financial and progress reports submitted to Qld Health Community Funding. (Colloquium, AEHRC 13th Annual eHealth Research Colloquium, Brisbane; DNAC, Developing Northern Australia Conference, Cairns; NHMRC, National Medical and Health Research Council 6th Annual Symposium co-hosted with Lowitja Institute ‘The Butterfly Effect: Translating Knowledge into Action for Positive Change’, Brisbane.)
Results

Due to the well-established relationship IUIH had developed with WIO clients over the preceding four years, CSIRO researchers were welcomed to undertake research in both locations. Most clients showed interest in the research, with some keen to try the technology to understand how it could be used to facilitate their own health management practices. Others felt it was not suitable for their personal needs. This latter position was more prevalent in one location over the other, and tended to be in response to the use of the mobile device itself, rather than the concept of supporting their health journey. That is, clients felt they were not familiar enough with the use of smartphones and associated applications to get sufficient benefit from an interactive diary. Even so, they contributed their thoughts for potential modifications.

The results of the engagement phase and two trials are presented in three sections. Modifications to the components of the platform requiring interaction, primarily expressing the views of WIO clients (Section 3.1); digitising the WIO program, in line with the requirements of IUIH exercise physiologists and staff responsible for program development and design (Section 3.2); and uptake of the technology, including the potential to influence health behaviours and participant feedback (Section 3.3).

3.1 Participants contributed innovative ideas for modifications

3.1.1 App features desired for managing chronic health conditions

Through engagement with WIO participants, the app was tailored to meet the requirements of Indigenous adults self-managing chronic health conditions. Suggested modifications that were made to the app included additional health measures such as treats, coffee, tea, massage and digestion; additional exercises undertaken by clients such as hydrotherapy, yoga, tai chi, meditation and home exercise; and additional symptoms including arthritis, nausea and pain. In response to a request to monitor mental wellbeing, a smiley face rating was included (Figure 4), with a provision to add notes. The addition of a notes section to other features of the app (such as stress) was also considered useful.

![Smiley faces](image)

Figure 4: Smiley faces give a rating for monitoring mental wellbeing.

Some of the additional features suggested by participants were beyond the scope of the current platform development, but were recorded for future versions. These included monitoring of medications and being able to access stress reduction resources such as sounds of country, mindfulness breathing or ocean/rain/forest audio files. At the beginning and end of each cycle, WIO exercise physiologists run a physical assessment on clients, including the 6 min walk test, timed up and go, step balance, waist and hip girth, height and weight. Some clients (particularly the long-term ones) felt it would be useful to have these before and after scores in their app so they could monitor their own improvement over progressive cycles. Some participants felt incentives could be useful, such as virtual medals for adherence, onscreen fireworks for goals achieved or encouraging messages recorded by a mentor such as Steve Renouf to pop up at strategic times to support motivation in their health self-management. Alerts to encourage movement, app updates and medication reminders were also considered potentially useful features.
3.1.2 Face of the app

In terms of the look and feel of the app, suggestions were made for colour variation, to more easily differentiate between list items; a preference for icons as used in the android version, over the word-centric Apple version; audio messages for those who are hard of hearing; large text and matching colour schemes to nature.

In deciding on a working name for the app, participants at both sites spoke strongly of the supportive value of mateship on their health journey. This was reflected in the names suggested:

- Healthy mate
- Health mate
- Healthy mate, healthy mob
- Healthy mate, happy mob
- Living health
- Health state
- Happy state
- Deadly health

The name ‘Healthy Mate’ was chosen, and affirmed by the group, as the working title for the app and showed under the app icon on their smartphone screen.

3.2 Digitising the paper-based program

While the participants were trialling the health diary delivered through the smartphone app, the digital version of the WIO program was under development. At the time of the project, the current WIO workbook was being updated, allowing the digital program to be developed using the latest information provided through the WIO program. The paper-based WIO program was delivered through a large, beautifully illustrated workbook, not all of which was suitable for delivery through the smartphone app. Components of eight topics were incorporated that would reinforce the information sessions given face to face during the WIO cycle and provide a resource for clients at home (Section 3.2.1). Components of the workbook that were of particular interest to the clients were augmented with additional app features (Section 3.2.2). Another component of the workbook, ‘deadly tips’, was also incorporated into the platform to form the basis of the motivational messages for smartphone delivery (Section 3.2.3).

3.2.1 Content selection for digital delivery

The eight topics chosen for inclusion in the digital program comprised Exercise, Healthy Mind, Keeping Safe and Active in Community, Managing Medications, Preventing Health Conditions, Healthy Eating, Foot Care, and Music. Currently, music is not being offered as an information package in the program, due to the lack of availability of an allied health professional in this domain, however, it was included in case a suitable staff member was appointed in the future.

For each topic, a maximum of four levels of information was provided to include as many resources as possible without inducing ‘click fatigue’ from having to access too many pages. Different levels of information and resources included are detailed for the Exercise component in Table 2. Illustrations from the workbook, IUIH graphics files and CSIRO graphics file supplemented the program to make it more appealing and engaging.

A comprehensive design process was undertaken to understand how various features of the app could augment and complement components of the digital program – for example having sleep diary entries that indicated difficulty with sleeping link to tips to sleeping soundly in the Healthy Mind component. While the software development required to link various features with components was beyond the scope of this project, the individual features and components were included so they could be linked in future.
Table 2: The wireframes for each topic of the workbook had four levels as illustrated for ‘Exercise’.

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exercise</strong></td>
<td><strong>Types of Exercise</strong></td>
<td><strong>Staying Safe when Exercising</strong></td>
<td><strong>Exercising When it’s Hot</strong></td>
</tr>
<tr>
<td><strong>Why is Exercise Important?</strong></td>
<td><strong>Blood Pressure</strong></td>
<td><strong>Helps me to manage...</strong></td>
<td><strong>Always bring a drink bottle with you - Aim to drink 2 litres of water every day</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Cholesterol levels</strong></td>
<td></td>
<td><strong>Always cool down and stretch</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Chronic diseases such as diabetes, heart disease and some cancers</strong></td>
<td><strong>Helps me to manage...</strong></td>
<td><strong>Drink water or have a cool drink, eat some food to replace lost energy</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Weight loss</strong></td>
<td><strong>You may be sore in your muscles up to 48 hours after exercise - This is normal! See your Exercise Physiologist if your soreness continues</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>The more food we eat, the more exercise we need to do!</strong></td>
<td><strong>Dehydration can lead to muscle cramps and heat illness</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Helps us balance 'energy in' vs 'energy out'</strong></td>
<td><strong>Have extra rest between sets when you feel hot</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Hey you fellas! Exercise can help you to:</strong></td>
<td><strong>Manage your weight in a fun way</strong></td>
<td><strong>See your Exercise Physiologist if you feel dizzy, nauseous or have a headache</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Look after the health of your whole body</strong></td>
<td><strong>Improve your balance and flexibility</strong></td>
<td><strong>Exercising in the Pool</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Have more energy to give more to family and community</strong></td>
<td><strong>Help you to sleep better</strong></td>
<td><strong>Make sure you enter the pool safely using the ramp and/or railings</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Manage your weight in a fun way</strong></td>
<td><strong>Prevent falls</strong></td>
<td><strong>Wear appropriate clothing</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Improve your balance and flexibility</strong></td>
<td><strong>All in all - it improves your quality of life</strong></td>
<td><strong>Drink plenty of water</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Hey you fellas! Exercise can help you to:</strong></td>
<td></td>
<td><strong>Exercising in the Pool</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Look after the health of your whole body</strong></td>
<td><strong>Benefits: Increases and/or maintains range of movement in the body such as neck, hips and shoulders. Also helps to prevent injuries.</strong></td>
<td><strong>Make sure you enter the pool safely using the ramp and/or railings</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Have more energy to give more to family and community</strong></td>
<td><strong>Benefits: Keeps our bodies strong, prevents injuries, increases confidence in everyday movements such as climbing stairs</strong></td>
<td><strong>Wear appropriate clothing</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Manage your weight in a fun way</strong></td>
<td><strong>Benefits: Keeps our bodies strong, prevents injuries, increases confidence in everyday movements such as climbing stairs</strong></td>
<td><strong>Drink plenty of water</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Improve your balance and flexibility</strong></td>
<td><strong>Benefits: Makes your heart and lungs stronger, lowers your blood pressure</strong></td>
<td><strong>Exercising When it’s Hot</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Help you to sleep better</strong></td>
<td><strong>Benefits: Keeps our bodies strong, prevents injuries, increases confidence in everyday movements such as climbing stairs</strong></td>
<td><strong>Always bring a drink bottle with you - Aim to drink 2 litres of water every day</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Prevent falls</strong></td>
<td></td>
<td><strong>Dehydration can lead to muscle cramps and heat illness</strong></td>
</tr>
<tr>
<td></td>
<td><strong>All in all - it improves your quality of life</strong></td>
<td></td>
<td><strong>Have extra rest between sets when you feel hot</strong></td>
</tr>
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<td></td>
<td></td>
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<td><strong>See your Exercise Physiologist if you feel dizzy, nauseous or have a headache</strong></td>
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<td></td>
<td></td>
<td><strong>Cardio Exercise (AKA Aerobic)</strong></td>
<td><strong>Always bring a drink bottle with you - Aim to drink 2 litres of water every day</strong></td>
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<td><strong>Dehydration can lead to muscle cramps and heat illness</strong></td>
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<td></td>
<td><strong>Have extra rest between sets when you feel hot</strong></td>
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<td><strong>See your Exercise Physiologist if you feel dizzy, nauseous or have a headache</strong></td>
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<td></td>
<td></td>
<td><strong>Examples: Running, swimming, bike riding, walking and skipping</strong></td>
<td><strong>Always bring a drink bottle with you - Aim to drink 2 litres of water every day</strong></td>
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<td></td>
<td><strong>Benefits: Increases and/or maintains range of movement in the body such as neck, hips and shoulders. Also helps to prevent injuries.</strong></td>
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<td><strong>Exercising in the Pool</strong></td>
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<td><strong>Make sure you enter the pool safely using the ramp and/or railings</strong></td>
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<td><strong>Benefits: Keeps our bodies strong, prevents injuries, increases confidence in everyday movements such as climbing stairs</strong></td>
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<td><strong>Wear appropriate clothing</strong></td>
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<td><strong>Drink plenty of water</strong></td>
</tr>
</tbody>
</table>
## Stretching and Flexibility

### What is Stretching and Flexibility?

Stretching - Lengthens your muscles and moves your joints. Helps reduce the risk of injury and maintain flexibility.

Flexibility - Helps us maintain and/or increase our range of movement in our joints like our hips, shoulders, knees and ankles.

### What are the Different Types of Stretches?

**Static stretches** - Where you hold a body part in place for up to 45 seconds

- Static stretches help get blood flow to your muscles and are useful to do before exercise that’s low to medium intensity such as walking, cycling and swimming

- Dynamic Stretches - This is where you move your limbs in a way that is similar to the exercise you are about to do

- Dynamic stretches help you to get blood flow to your muscles and help you to get ready for exercise at medium to high intensity such as running

### Core and Daily Life

Core muscles are some of the most important muscles in the body. We use them without even knowing it! How do they help?

- Help your back stay straight
- Allow you to bend and twist
- Keep internal organs in place
- Provide protection for internal organs and your spine

*** PICTURE FROM EDUCATION BOOK ***

There are many different layers of core muscles, which help us to move in all directions. A strong core will:

- Reduce lower back pain
- Improve your balance
- Give you increased range of movement
- Reduce incidence of incontinence
- Helps with all movements of the body

*** PICTURE FROM EDUCATION BOOK ***

### Exercise Goals

Deadly Tips to help your achieve your goals

- Make a plan and write it down
- Have a think - What has stopped you from reaching your goals in the past?
- Find someone you look up to and trust to support you
- Celebrate every successful step! Try and reward yourself with something pleasant that isn’t always food or drink

A Good Goal is S.M.A.R.T.

- S - Specific. Is it detailed and exact?
- M - Measurable. Can you measure it?
- A - Achievable. Can you make it happen?
- R - Realistic. Is it reasonable to expect this of yourself?
- T - Timely. Give your goal a time-line and an end date!
3.2.2 Features designed to augment the digital program

Clients were interested in app features associated with nutrition

Most clients expressed an interest in food intake and nutrition. During the WIO cycle, a dietitian would yarn about food plates, giving information of serving sizes and recommended daily intake of different food groups. The session would include a cook up demonstrating how to modify a recipe (recipe renovation) to make meals as healthy as possible (Figure 5).

Given the strong interest in nutrition, it was important to ensure that the digital program and smartphone app provided participants with all the resources they required to facilitate healthy eating and allowed them to record specific measures of interest. For this reason, the Healthy Eating section of the digital program included a wealth of resources on food groups, eating plans, tips to prevent over eating, fats, carbohydrates and a glycemic index, recipe renovations and information on food labels, all taken from the WIO workbook.

Figure 5: A dietitian demonstrates healthy eating during an information session (top), the principles of which can be accessed through the digital program. Clicking on the Healthy Eating tab (bottom left) access a range of nutritional information and resources including healthy modifications for recipes (bottom right).

Those clients who wanted to increase their fruit and/or vegetable intake could use the health diary to monitor how many serves of fruit or vegetables they had. There were, however, some clients who were more interested in their food intake than just recording fruit and vegetable consumption. These clients were particularly interested in understanding the types of food they were eating and how it related to recommended standard servings for each of the five core food groups. To meet this need, an interactive food plate was developed so that participants could record the number of servings of each food group they had over the day (Figure 6). Over time, this data could be plotted by IUIH exercise physiologists using the portal to provide a longitudinal picture of dietary patterns relative to recommended daily intake.
Figure 6: An interactive food plate was developed for WIO participants who wanted to record their food intake against recommended daily food group consumption (top left). Alternatively, the health diary allowed monitoring of specific food groups, such as vegetables (top right). Graphs show adherence to recommended servings over time.

A somatic map was developed to record pain and strain injuries

A primary focus of the WIO program was the exercise component, and yet many clients had physical difficulties that limited their ability, short or long term, to fully participate in the exercise program. To capture these difficulties and differentiate between pain and strain caused by a new exercise, a somatic map was developed (Figure 7). This allowed clients to indicate areas of pain or strain and allowed exercise physiologists to have a conversation around whether the strain was expected (for example, the new exercise was being executed correctly) or if the new exercise should be observed to correct posture to prevent strain in a muscle group not targeted by the exercise. Similarly, where pain was indicated the exercise physiologist could revise the exercise program to strengthen muscles that could help relieve the pain and rest muscles that would exacerbate the pain.
Figure 7: A somatic map was developed to allow clients to indicate body areas in which they were feeling pain (red dot on arm) or sprain (green dot on calf) with provision to include a rating for intensity and duration.

3.2.3 Contributions for the motivational component

A final component of the health program delivered through the smartphone app was the motivational content. The mobile health platform sends SMS messages pertinent for each week of the program. For the WIO program, it was decided to use the deadly tips that punctuate the WIO workbook (Figure 8) (‘deadly’ is Aboriginal English for ‘excellent’ or ‘awesome’). Forty-three deadly tips, related to all aspects of the program were derived from the WIO workbook, and an additional nine messages were suggested by participants (Table 3). Clients were quite creative when it came to devising new messages for delivery, but not all their suggestions could be included. For example, one client suggested that the pedometer on the smartphone could be utilised for motivation. If no activity was recorded for an extended length of time, a message could appear saying “I haven’t moved for X hours, have you?” This idea, while an exemplar of the wit of the clients, was beyond the scope of the current platform development, as it involved coupling the phone pedometer with the program. Instead it was agreed that the message ‘Don’t forget to move around if you’ve been sitting for too long!’ could be incorporated into the messages relating to ‘Physical Activity’. The 52 messages were delivered throughout the 12 weeks of the WIO cycle, at a rate of about four per week, in the week most applicable to the program being delivered where possible. This rate was chosen to prevent ‘message fatigue’ from receiving too many notifications. Instead of SMS messages, which require an active network, the messages were embedded in the app as ‘pop-up’ messages (pop-up messages increase the size of the app, but do not use data to activate).

Figure 8: Deadly tips, taken from the WIO workbook, formed the basis of the motivational messages.
Table 3: Examples of motivational messages taken from deadly tips and participant suggestions.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Motivational message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily living routine</td>
<td>Do you fellas know why routines are important? Help you remember things like taking your medication; Can give your life structure; Help you to handle unexpected changes; Help you to achieve your goals!</td>
</tr>
<tr>
<td>Goal setting</td>
<td>Come on Mob, Let’s keep our passions alive! Tell me your dreams... Are they different to todays? Let’s make a game plan so you can work towards your dreams. Talk to your health staff about things to add to your game plan</td>
</tr>
<tr>
<td>Reading food labels</td>
<td>When reading the ingredients list look for sugar or fat listed in the first three ingredients. This can sometimes tell us that the food is not the best option.</td>
</tr>
<tr>
<td>Physical activity</td>
<td>Have you gone for a walk today?</td>
</tr>
<tr>
<td>Stretching</td>
<td>Stretch 2-3 days per week to increase flexibility</td>
</tr>
<tr>
<td>Client suggested</td>
<td>Do you need to drink more water today?</td>
</tr>
<tr>
<td></td>
<td>Have you gone for a walk today?</td>
</tr>
<tr>
<td></td>
<td>Don’t forget to move around if you’ve been sitting for too long!</td>
</tr>
<tr>
<td></td>
<td>Try and limit how many sweets you eat.</td>
</tr>
<tr>
<td></td>
<td>Remember to eat breakfast!</td>
</tr>
<tr>
<td></td>
<td>Try and limit how much food you eat after 8pm.</td>
</tr>
<tr>
<td></td>
<td>Don’t forget to record your daily health measurements!</td>
</tr>
<tr>
<td></td>
<td>Do you know how big a ‘serving’ is?</td>
</tr>
<tr>
<td></td>
<td>Why are you looking in the fridge?</td>
</tr>
</tbody>
</table>

3.3 Technology uptake was variable across the cycle(s) and the sites

During the first trial of the health diary, delivered through the smartphone app, WIO clients in the Gold Coast \((n=11)\) used the technology to a greater degree than the Woolloongabba clients \((n=6)\) (Figure 9). Excluding participants with zero entries \((n=3\) at the Gold Coast and \(n=2\) at Woolloongabba), mean number for entries per person was 76 compared to 33.25 respectively, with four clients at the Gold Coast making over 100 entries each. In contrast, only three of the Woolloongabba clients made more than four entries over the 12 week WIO cycle. Due to these differences, the second trial, consisting of the updated health diary and digital education program, was offered to all Gold Coast clients, and only those Woolloongabba clients who expressed strong interest.

At both sites there were participants who were keenly interested in the technology and its potential to facilitate their health journey. There were, however, participants who expressed more ambivalence about the technology and its utility. Some of the latter participants did not feel that they were familiar enough with smartphone use to benefit from an electronic health diary. This sentiment was most strongly expressed in the Woolloongabba location. To address this issue, one of the researchers made themselves available prior to WIO sessions to run people through smartphone use. These sessions were not well attended.

In both locations, participants made more entries associated with metrics that were taken as part of the WIO program, such as blood pressure, heart rate, exercise and blood glucose (for clients managing diabetes), than they did for other lifestyle factors such as coffee and water intake, or sleep and stress assessments (Figure 9).
Figure 9: Gold Coast participants made more health diary entries than Woolloongabba participants, with clients in both groups more likely to enter metrics directly associated with the Work It Out program, than those associated with other lifestyle factors.

3.3.1 Log Data analysis

The log data analysis is based on the occurrence of ‘events’, where data is entered into the app. As the digital program is read only, use of the program screens does not contribute to event logs. Therefore the log data analysis refers to use of the health diary in the first trial, and the health diary, somatic map and interactive food plate in the second trial. It is plausible that the content of the digital program influenced the use of the health diary in the second trial.

Analysis of the log data indicated that there were more active users per week in the second trial than the first (Figure 10). The first trial ended in September 2016 and the second in March 2017, however, because of the differences in how emerging apps are trialled, android users had access to the app post trial (October through to January, and in April). Conversely, iPhone users were unable to access the app once each trial concluded. Hence, the drop off rate on the right of each figure is related to trial cessation, and app unavailability, rather than waning interest.

The increased usage in the second trial is likely to be due to a combination of factors including increased familiarity with the app, increased functionality with the inclusion of the added features – somatic map and interactive food plate and, potentially, recognition of the app’s contribution and usefulness in chronicling a health journey.

The majority of users were Gold Coast participants (Figure 11). A comparison of Figures 10 and 11 shows that, for both trials, data from only two Woolloongabba participants per week contributed to the overall log data analysis.

Given that the majority of users were Gold Coast participants, data for this group only were further analysed for usage trends. The three peaks in number of users in the second trial (Figure 11, right) correspond to researcher site visits, the first two of which included adding new participants or trouble shooting app access for existing participants. Similar spikes are seen in the number of events on these days (Figure 12). Together these data suggest that researcher presence not only resulted in an increase in the number of participants, but also in increased usage by existing participants.
Figure 10: Total number of users per week in both sites combined over the first (left) and second (right) trials.

Figure 11: Number of Gold Coast participants contributing to the total number of users shown in Figure 10.

Figure 12: The highest numbers of events were recorded in the first and last weeks of the second trial.
As would be expected from the previous graphs, the average number of events per user per week was higher in the second trial (Figure 13), than in the first; and was more consistent across the course of the WIO cycle.

Figure 13: The average number of events per user per week was highest in the last week of the second trial.

Just before the second trial ended there was a surge in average number of events, per user, per week (Figure 13, right), coinciding with researcher feedback that a preliminary analysis of one individual’s health data resulted in insights that had the potential to influence their behaviour.

Results have the potential to influence behaviour

Preliminary results from the current trial suggest that insights into how lifestyle factors interact with health measures have the potential to influence health behaviours. When stress levels for one participant were plotted against ‘treats’, no relationship was observed, suggesting that this participant is not a ‘comfort eater’. When, however, stress was plotted against mobility derived from the phones’ pedometer, a positive relationship was seen where stress levels increased as steps per day increased (Figure 14). This allowed the participant to examine their routine to determine if moving about made them stressed; or if stress made them agitated and more active. The participant felt the former was more accurate, which in turn allowed them to accommodate rising stress levels by scheduling a relaxing evening after a busy day so as not to overwhelm themselves with activities. The trend line suggests that overall, the participant’s stress levels have reduced over the course of the program. This parallels the exercise physiologist’s observations, and their own observations, of improved mobility. Further insights into the impact of mobility on stress levels were seen in the client’s notes.

Use of the ‘note’ feature

Some of the functions of the app were accompanied by the provision for notes. This allowed participants to record corresponding information regarding, or potentially influencing, the variable being measured. A total of 152 notes were made by nine participants, with the number for each participant ranging from very low use (1) to quite high use (60). Three participants accounted for 133 of the notes. The notes facility was most often accessed for health measures including tea or coffee (usually to note how many sugars were added); treats (what constituted a ‘treat’ on that occasion, often featuring donuts or chocolate); and explanations for stress level or mental health ratings (on the scale illustrated in Figure 4). The explanations for the stress level and mental health were particularly insightful, as over time these provide a stark picture of which aspects of the client’s life are working, and which aspects require attention. This shifts the locus of control to the client as it allows them to separate themselves from external events (or people) that cause them stress; or to assess the permanence of the stress-causing agent. For the client depicted in Figure 14, elevated stress levels were accompanied by notes indicating visiting relatives and associated increases in mobility demands (e.g. shopping).
Figure 14: For the depicted participant, there is no association between treats and stress levels during the six week period examined (top), suggesting that this participant is not a ‘comfort eater’. There is, however, an association between stress levels and mobility during the six week period plotted, although the direction of the relationship is not known.

3.3.2 Feedback from the clients on app features and using their smartphones as a health tool

Throughout the project, researchers yawned with clients about the features they liked and did not like about the platform. Negative feedback was generally in regard to the amount of data that needed to be entered and the difficulty of entering data when they were not familiar with the smartphone. Some felt their memory was a barrier, as they forgot to bring their phone to the gym, and then once home forgot to enter their measurements. Positive feedback was received around the usefulness of having physiological records that they could look back over to monitor their progress and which they could show their GPs.
4 Discussion

The relationship that IUIH and WIO had developed over several years with Aboriginal and Torres Strait Islander people in metropolitan areas facilitated CSIRO’s engagement with WIO participants to determine how the technology could meet their needs for monitoring health-related factors. Together with engagement with IUIH staff to determine which aspects of the paper-based program material could be made digital, the whole platform was adapted to develop a culturally sensitive technology to augment self-determination in current programs for chronic health management.

Modifications suggested by clients were made to the health diary to include health measures of interest including meditation and yoga. IUIH design and program staff, together with CSIRO staff, identified components of the paper-based WIO program that could be delivered digitally. Interactive components for daily food group servings and pain management were also included.

The platform was best utilised by clients who had a working knowledge of smartphones as an assistive technology (those who used apps as well as call functions), with health measures directly related to the WIO program entered most often. The technology was used more in the second trial than the first, and to a greater extent by Gold Coast clients than those from Woolloongabba. The greatest benefit for participants came from an ability to show health records to their GP and a greater awareness of factors influencing the management of their chronic health conditions.

The project demonstrated that technology can be implemented into existing health programs to support urban Aboriginal and Torres Strait Islander people in managing their chronic conditions if it is directed and owned by them, and developed under collaborative conditions.

4.1 Working with the mobs

The strength of this project lay in the willingness of clients to work with researchers to design a useful technology developed in line with cultural protocols that recognised the value of the input by Aboriginal and Torres Strait Islander people. Several modifications were suggested during the engagement phase, many of which were incorporated into the technology for trial. Engagement with IUIH staff and clinicians resulted in development of a digital version of the WIO program that can be employed through the smartphone, and/or used as a resource by IUIH. In trialling the platform, it was found that those participants who were willing and able to enter data received value out of the technology. This occurred specifically regarding participants being able to develop a greater understanding of the personal factors that impact their health and in having a record of physiological data for health service providers.

One of the most exciting aspects of working in this space was the original thoughts that arose through discussions with the WIO clients. Their desire to improve awareness of how their emotions and lifestyle factors contributed to their health resulted in the more innovative elements of the technology, such as the interactive food plate. Hence, the ‘wish list’ for future technology is long and includes improvements for the look and feel of the app with preferences for colours of nature; incentives, such as messages from key Indigenous role models on achieving goals; stress reduction including sounds of country; and alerts including their personal favourite, having the phone send a message saying “I haven’t moved for the last X hours...have you?”.

Some of the most animated discussion was around what to call the working version of the app, with participants in both locations focusing on the mateship of the WIO program, and how working together formed an integral part of their positive health journey. The participant who suggested ‘Healthy mates’ was one of the most regular users of the app for measures related specifically to the WIO program. Their success suggests that ‘Healthy Mates’ is also perhaps the best way to view the role of digital technologies in self-management of chronic disease and improving health autonomy.
4.2 How to improve uptake of eHealth technologies

Uptake of the technology differed across the two locations, with a higher use recorded at the Gold Coast than by Woolloongabba clients. This could be explained by a younger, on average, cohort at the Gold Coast, or by a higher aptitude for online technologies. Prior to commencing this project, WIO clients at the Gold Coast had raised the idea of augmenting the program with online technologies such as social media platforms. During the engagement phase, several of the Gold Coast clients were quite passionate about the refinements of the technology and the potential benefits that could be realised through incorporating monitoring of lifestyle factors such as mental wellbeing and food intake into their chronic health journey. Those who offered the most suggestions went on to use most aspects of the app, and in turn, received the most benefit from the technology. This clearly demonstrates the value of input and ownership in developing technologies for use by people managing a chronic health condition.

While the Woolloongabba participants may not have added as much data as is required to consistently and effectively monitor their respective conditions, they spoke about how they could see the benefit of the app in the monitoring of health metrics and chronic disease symptoms. Data input to the app may have increased if its use was also actively encouraged from multiple sources outside the Program, such as the local GPs or medical services. During the trial periods, clients reported some medical specialists only gave limited recognition of the records kept on the app, while others saw value in reviewing the data. Greater involvement of the Aboriginal medical service at both the development and implementation phases would positively contribute to the regular use of the app by participants and allow medical specialists to recognise the value of the app for monitoring health metrics, particularly in clients with chronic health conditions.

Much of the reluctance to use the technology came from lack of familiarity with smartphones and associated apps. Some clients had never owned a mobile phone, while others only used their smartphones for basic functionality (such as calls and SMS). Clients who had never used mobile apps were simply not accustomed to using their phone as an assistive technology. Digital literacy could be improved by formally incorporating a training phase into the engagement period, where participants were actively engaged in learning to use all aspects of the smartphone required for participation. While such training was offered on a casual basis, many of the participants either did not bring their phones to the session, and/or did not wish to come earlier to participate in training prior to their WIO session. Younger participants were more accepting of the technology, suggesting that uptake of eHealth technologies will improve over time. It would be insightful to trial the technology more comprehensively with a younger audience.

Support for the notion of familiarity increasing uptake is provided by the increased usage in the second trial, although this may also be due to increased functionality with the inclusion of the added features – the WIO program, somatic map and interactive food plate and, potentially, recognition of the app’s contribution and usefulness in chronicling a health journey. At a state-wide level, digital inclusion is recognised as a priority for Aboriginal and Torres Strait Islander people, particularly in remote communities. The introduction of the Deadly Digital Communities program will help to increase familiarity with digital technologies. The program is a State Library initiative to provide community-based training in digital skills to facilitate access to health, financial and social services. Over the next two years, the program will be available in 26 remote communities in Queensland. The uptake of digital technologies for health is likely to be greater in communities where this program has been successfully established.

4.3 Insights

During both trials, the health measures that directly related to the WIO program were recorded more often than lifestyle factors. This is most likely due to encouragement from the exercise physiologists and other clients, and the temporal proximity of measurements and recordings. There may have been a reluctance by

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participants to enter data for variables like alcohol, smoking, coffee, due to a perceived potential for judgement from those reading the data (IUIH and CSIRO). However, all clients used the app in a slightly different way, and it is not surprising that the measures that directly related to physical health would be recorded over measures perceived to be indirectly related. The individual variability in app use is exemplified by use of the ‘notes’ feature. Of the 152 notes made, 133 (87.5%) notes made were added by just three people. This means that 13% of people used notes extensively; six people (26%) used the note function at least once; and the remaining 14 people (60%) did not use it at all.

During the project it become apparent that Aboriginal and Torres Strait Islander people view health in a number of different ways and that health technology will be more appropriate for some people than others. The strong intellectual investment from the WIO participants demonstrated the importance of Indigenous ownership and voice in developing culturally appropriate technology and that modifying existing technology requires a high level of attention to detail to ensure that every nuance of the technology is appropriate. For example, two weeks prior to the end of the final trial period, the researchers noticed that when adding participants to the portal the options for title were the standard Mr, Mrs, Ms, Miss. Yet Aboriginal and Torres Strait Islander people across Australia commonly identify with the titles Auntie (or Aunty) and Uncle. This glaring oversight of such a small, but incredibly meaningful, customisation highlights both the simplicity and complexity of cultural adaptations.

4.4 Summary of modifications

Through engagement with WIO participants, exercise physiologists and other IUIH staff, modifications were determined for all three platform components (Table 4). While many of these modifications were easily incorporated, there were some that were beyond the scope of this project. These are shown in italics in Table 4. For example, some clients (particularly the long-term ones) felt it would be useful to have before and after assessment scores in their app so they could monitor their own improvement over progressive cycles. The most important function for future versions would be to link up the components such that entering scores for one health measure gave the user the option to review associated resources. For example, if the vegetable count was low for the day a link to ‘recipe renovation’ (see Figure 5) would pop up at 7pm or when the user normally prepared the evening meal; or a ‘poor’ sleep entry would link to resources to improve sleep.

Table 4: Modifications suggested for the platform technology.

<table>
<thead>
<tr>
<th>Platform component</th>
<th>Additions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>App</strong></td>
<td></td>
</tr>
<tr>
<td>Health measures</td>
<td>Treats, massage, stool chart, medications</td>
</tr>
<tr>
<td>Exercise</td>
<td>Hydrotherapy, yoga, meditation, tai chi</td>
</tr>
<tr>
<td>Symptoms</td>
<td>Arthritis, pain</td>
</tr>
<tr>
<td>Mental health</td>
<td>Smiley face meter, stress reduction (sounds of country)</td>
</tr>
<tr>
<td>Additional items</td>
<td>Somatic map, stool chart graphics, recipes, food plate builder, incentives, alerts</td>
</tr>
<tr>
<td>Assessment scores</td>
<td>Before and after scores for 6 min walk test, timed up and go, step balance, waist and hip girth, height, weight</td>
</tr>
<tr>
<td><strong>Program</strong></td>
<td></td>
</tr>
<tr>
<td>Digital information</td>
<td>Exercise, Healthy Mind, Keeping Safe, Managing Medications, Preventing Health Conditions, Healthy Eating, Foot Care, Music</td>
</tr>
<tr>
<td>SMS Messages</td>
<td>Deadly Tips from WIO workbook plus client suggestions</td>
</tr>
<tr>
<td><strong>Portal</strong></td>
<td></td>
</tr>
<tr>
<td>Client information</td>
<td>Program checklist, Auntie/Uncle titles, Pre program survey data</td>
</tr>
</tbody>
</table>

Modifications in italics will be implemented in future versions.
4.5 Future Recommendations

Overall, clients of the WIO program were positive toward development and use of the health app and digital program, with particular enthusiasm from younger clients. There is potential for future research around incorporating the features shown in italics in Table 4 as well as:

- Additional trials with younger clients at risk of chronic conditions in the WIO program with a view to developing a version in line with a more digitally inclined group;
- Developing a version in which components were reciprocally linked such that entering scores for one health measures gave the user the option to review associated resources;
- Trialling the technology with younger/working clients at risk of chronic conditions but not in the WIO program and evaluating uptake, adherence, effectiveness and outcomes;
- Conducting a trial to determine if the platform helps increase physical activity and/or improves diet outside WIO compared with IUIH clients not using the app.

There is also the potential to conduct studies outside the metropolitan area. The Deadly Digital Communities program aimed to be available from August 2017 in Bamaga, Cherbourg, Hammond Island, Injinoo, Mabuiag Island, New Mapoon, Palm Island, Poruma Island, Seisia, Umagico, Wujal Wujal and Hope Vale and in 2018 in Aurukun, Lockhart River, Woorabinda, and Pormpuraaw with another 10 communities to be added. Combining a mobile health platform with health outreach such as WIO, or similar program, in these communities could lead to improved health autonomy and more integrated health care for Aboriginal and Torres Strait Islander people.
5 Conclusion

The IUIH system of care aims to improve integration between allied health and primary health care. By including GPs in the health journey through sharing the health records in the app, the technology assisted WIO clients in integrating the WIO program into their primary health care.

This project demonstrated that it is possible to modify existing technologies to augment programs designed for Aboriginal and Torres Strait Islander adults managing chronic health conditions. By following appropriate cultural protocols that recognise the value of input from Aboriginal and Torres Strait Islander people themselves, and working closely with Indigenous health providers, Aboriginal and Torres Strait Islander adults were provided an opportunity to refine a technology to augment their existing health program to suit the needs of their chronic health journey.
References


Part II  Impact

Dissemination outcomes from the Indigenous Health Portal Project
Partnerships to enhance Indigenous health autonomy:
Modifying a mobile platform to augment an existing program for chronic health
Tasas Basit, Health Psychologist, IUIH and Dana Kai Bradford, Research Scientist, CSIRO
March 2017

Thanks to: Work It Out participants from Woolloongabba and Gold Coast WIO Programs

Institute for Urban Indigenous Health

Est. 2009 in South East Queensland

Approximately 60,000*
Indigenous people
(38% of QLDs’
Indigenous population)

More than the total
Indigenous population
of Victoria
Institute for Urban Indigenous Health

IMPROVING AND INTEGRATING URBAN INDIGENOUS HEALTH SERVICES

The Institute for Urban Indigenous Health unites, coordinates and leads community-controlled health services in South East Queensland.

CLINICAL SERVICE CBR/FRAY
ALLIED HEALTH
CHILD & MATERNAL HEALTH
PREVENTATIVE HEALTH
RESEARCH INNOVATION & WORKFORCE DEVELOPMENT
HOME SUPPORT

Partnerships to enhance Indigenous health autonomy

Institute for Urban Indigenous Health

- Undertakes regional planning, monitoring and evaluation processes related to service provision;
- Co-ordinates regional programs in areas including smoking, physical activity, nutrition and clinical services; and
- Provides a ‘hub and spoke’ model of allied health service delivery.

Partnerships to enhance Indigenous health autonomy
Innovation Hub Pilot Project

• In July 2014, The Department of Science, Information Technology, Innovation and the Arts (DSITIA), in partnership with PricewaterhouseCoopers (PwC), launched the Innovation Hub Pilot Project to engage private and public sector experts to develop solutions for complex problems.

  Indigenous Health –
  it is hard for Indigenous Australians living in remote communities to recognise their cardiovascular risks and to identify accessible and relevant options to improve their health.

Care Assessment Platform

Improvement in uptake and outcomes

[Graphs and figures showing data on improvement in different measures such as distance, weight, depression/anxiety scale, etc.]

Modifications with Indigenous stakeholders

[Graphs and figures showing digital technology tools for monitoring health parameters like sleep, glucose, exercises, and alcohol consumption.]
Work It Out

- Chronic disease self-management and rehabilitation program
- Adult urban Aboriginal and Torres Strait Islander people
- For those with or at risk of a chronic disease
- 12 week ongoing cycle, at least 2 sessions per week
- Implemented across ten sites in Indigenous Community Controlled Health Services in South-east Queensland, and four in Central Queensland
- Interdisciplinary allied health team

Joining Work It Out

- Member of a partner health service
- Aboriginal or Torres Strait Islander
- Over 18
- Has or is at risk of having a chronic disease

- 45 min
  - Chronic disease self-management group education/ yarning

- 60 min
  - Individually tailored exercise program in a group setting

- 15 min
  - Tukko and a yarn

- GP referral to Exercise Physiologist
  - EPC or other

- Initial assessment with Exercise Physiologist
  - Medical Hx
  - Physical Ax
  - Psychometric Ax
Allied health, yarning sessions, exercise

Engagement with EPs and clients

Additions in line with cultural perspectives

Reframing health

“Health... not just the physical wellbeing of an individual but... the social, emotional and cultural well-being of the whole community...”

- NAHS, 2013

Places health within historical, political, cultural and social contexts.

“What does health and wellness mean to you?”

Parmenter, J et al., Considering Urban Aboriginal and Torres Strait Islander Conceptions of Heath.

• Reframed our thinking
  • Negative measures
  • Positive measures

• Addition of positive measures
  • water
  • massage
  • happiness

• Now incorporated in broader technologies
Adaptations for chronic health

Work it Out clients present with a variety of chronic health conditions:

- musculoskeletal issues/injuries
- mental health conditions
- respiratory issues
- hypertension
- diabetes
- hypercholesterolemia
- chronic pain
- cardiovascular condition/hx

Symptoms measures added:

- Arthritis
- Nausea
- Pain

Exercises added

- Hydrotherapy,
- yoga,
- meditation,
- tai chi

- Somatic map

Exercise to manage health

- Gym, hydrotherapy

Education sessions to promote self management

Digital WIO Program

The WIO workbook contains:

- Information from 8 different allied health professions on self-management strategies
- Activities and diaries for management and monitoring
- Deadly tips and cautions

It is accessible, relatable and practical as a companion to WIO yarning sessions.
Digital WIO Program

- Digital program augments workbook and information sessions

- Deadly tips sent as messages

Healthy Tukka as an example of integration

Dietitians yarn about food plates at the program.

WIO clients made it clear that they would like to be able to track how many serves of vegetables, starches, etc they were eating a day.
The Story of Stella*

* Pseudonym

Thank you

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Acknowledgements:

Qld Health

WIO participants on the Gold Coast
WIO participants in Woolloongabba

IUIH staff: Alison, Amy, Mitch, Binh,
Samara and all the exercise physiologists

CSIRO: Natalie Lee, Cath Daly, Karen
Harrap, Derek Ireland

Consultant and Participant: Jim Walker
Appendix B Health Informatics Conference 2017

Paper submitted to Health Informatics Conference, Brisbane 2017
Status: Accepted as poster (withdrawn to rework for submission elsewhere)

Healthy Mates:
Collaborations to enhance Indigenous health autonomy

Abstract. Health outcomes for Aboriginal and Torres Strait Islander people are most likely to be successful if health programs are led by Indigenous health providers and supported by collaborations with key stakeholders. In 2015, IUIH and CSIRO formed a collaboration to modify an existing CSIRO platform technology to deliver a digital version of an existing IUIH health program for chronic disease self-management. Following a consultative process, the tailored technology was trialed in two locations and in two phases, with the initial phase trialing a modified health diary and the second, ongoing, phase covering both the health diary and a digitised health program. Results from the initial trial suggest that the technology is more appropriate for some participants than others, and that participants are most interested in tracking those health measures that are directly related to the Work It Out program, such as blood pressure, heart rate and blood sugar. Participants reported that advantages of the health diary included a greater awareness of factors contributing to their health and the ability to show their GPs accurate records of their health data over specific timeframes. Preliminary results from the ongoing trial echo and expand on these advantages. This project has demonstrated that e-health technology can be used to augment existing Indigenous health programs.

Keywords. Aboriginal and Torres Strait Islander, Indigenous, Health, platform technology, exercise, participatory design, chronic disease, CDSM.

Introduction

Positive health outcomes for Aboriginal and Torres Strait Islander people are most likely to be gained if initiatives are led by Indigenous health providers. The Institute for Urban Indigenous Health (IUIH) is an Aboriginal and Torres Strait Islander Community Controlled Organisation established in 2009 which leads the planning, development and delivery of comprehensive primary health care to Indigenous communities in SE Queensland, Australia’s second largest but fastest growing Indigenous population. IUIH is improving access and health outcomes through expansion and reform of Community Controlled Health Services and through strategic partnerships with mainstream health providers and institutions, including CSIRO.

The AEHRC has a strong background in the development of platform technologies to facilitate and enhance e-health services, including the first clinically validated mobile delivery of cardiac rehabilitation (CR) services through a platform technology. In a randomised controlled trial, the smartphone-delivered CR program improved uptake, adherence and completion rates of rehabilitation in CR patients, as well as performing equally or better than traditional clinic-delivered services in health outcomes 1. In 2015 the AEHRC was tasked with modifying this technology to address awareness of heart disease and access to services in Aboriginal communities 2. To do this, AEHRC worked with IUIH with a view to implementing a similar platform technology into a health and exercise program conducted with metropolitan Aboriginal and Torres Strait Islander adults.

The IUIH WIO program was considered an ideal program for co-development of appropriate platform technology for chronic health management. This chronic disease self-management and rehabilitation program designed for Aboriginal and Torres Strait Islander people at risk of, or diagnosed with, a chronic...
Digital Technology to Support the Work It Out Program

disease commenced in 2011, and is now delivered across 10 community controlled health services in SE Queensland and has recently expanded to four Central Queensland locations. Work it Out includes group education by a range of allied health professionals, individually-tailored and supervised gym-based exercise prescribed by an exercise physiologist, and ends with tukka in a social atmosphere after exercise. The program runs for two hours, two to four times a week with six-20 participants each session. Once a participant commences the program, they can continue attending as long as needed. Work It Out applies self-management concepts using a culturally responsive approach and aims to increase empowerment and build self-confidence to engage in health behaviours. Work it Out participants are given continuous opportunity to provide both formal and informal feedback to program staff so their perspectives are heard and incorporated into program structure, delivery, research and quality improvement. This enables transparency and facilitates trust, community ownership and determination.

In this paper we discuss the engagement process undertaken with the WIO program participants and staff in order to develop a culturally appropriate technology to augment the WIO program and enhance health autonomy in participants. We describe the modifications made following the engagement period, usage results from an initial trial of primary modifications and preliminary results from a current trial.

Methods

This project was conducted as an amendment to the existing WIO project, with approval from the University of Queensland’s Institutional Human Research Ethics Committee (2011001283) and reciprocal approval from CSIRO Health and Medical Human Research Ethics Committee (12/2016).

Participants

Two groups of participants were consulted during a 12-week engagement period (April-June 2016) and two 12-week trial periods (July-Sept 2016 and January-March 2017). The first group comprised WIO participants in two locations, Woolloongabba and Gold Coast. The WIO program attracts both regular and ad hoc attendance and as such, some participants were consulted more often than others. In each location, up to 20 people attend the IAR WIO program over the course of a cycle.

All attending participants were eligible for the study and included in yarning (Section 2.2), with many of those who attended regularly (n=23) interested in trialing the platform in either or both of the two trials (Table 1). Participants who were keen to trial the platform but did not own a mobile phone, or a compatible mobile phone, were given a smartphone (n=3). No other incentives were provided. The second group of participants comprised IUIH staff including exercise physiologists and those responsible for program development and design.

Table 1. Demographics of participants in the Work It Out Program

<table>
<thead>
<tr>
<th></th>
<th>Woolloongabba (n=8)</th>
<th>Gold Coast (n=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>61.9 (43–81)</td>
<td>62.7 (31–76)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td>F=4, M=4</td>
<td>F=11, M=4</td>
</tr>
<tr>
<td>Identify as Aboriginal or Torres Strait Islander</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td># with diagnosed chronic disease or condition</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td># with risk factors</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td># with compatible smartphone*</td>
<td>6</td>
<td>14</td>
</tr>
</tbody>
</table>

* Three participants were given smartphones so that they could participate.
Procedure

Engagement with WIO participants and IUIH staff

Engagement with WIO participants was conducted through a focus group format to allow yarning (an informal approach to sharing information and gathering thoughts, views and opinions in line with Aboriginal and Torres Strait Islander values). During yarning, the platform technology was introduced, demonstrated and discussed in detail. Researchers attended several WIO sessions during one 12-week cycle to obtain perceptions and criticisms of the technology to inform modifications and improve its applicability for Indigenous adults with chronic health conditions.

A meeting with all exercise physiologists was held to determine their requirements for modifications to the health diary and digital program. They were then given the opportunity to feedback their thoughts and ideas over the initial 12-week engagement period. Ongoing engagement with the two exercise physiologists responsible for the WIO sites as well as program development and design staff was conducted in an iterative process throughout the study period.

Trialling the suggested modifications

Additional health measures and exercise options were incorporated at the end of the engagement period and trialed in subsequent WIO cycles. A digital version of the WIO program and additional diary functions were incorporated prior to the second trial. Researchers regularly attended sessions during the two implementation trials to obtain feedback and assist with any technical or operative difficulties.

Platform technology

The platform technology comprises three elements – the clinical portal which holds the participants’ data, the health program and the smartphone app (Apple and Android) through which the program is delivered and which houses the health diary (Figure 1).

Results

Due to the relationship IUIH had developed over several years with Aboriginal people and Torres Strait Islanders in metropolitan areas, the researchers were well received by WIO participants in both locations. In general, participants at the Gold Coast actively participated and provided a wealth of information useful for technology development, while those at the Woolloongabba were more reserved.
Participants contributed innovative ideas for platform modifications

Through engagement with WIO participants, exercise physiologists and other IUIH staff, modifications were determined for all three platform components (Table 2). The majority of modifications were made, with some ideas stored for future versions. In deciding on a working name for the app, participants at both sites spoke strongly of the supportive value of mateship on their health journey.

Table 2. Modifications suggested for the platform technology

<table>
<thead>
<tr>
<th>Platform component</th>
<th>Additions</th>
</tr>
</thead>
<tbody>
<tr>
<td>App: Health measures</td>
<td>Treats, massage, stool chart, medications</td>
</tr>
<tr>
<td>App: Exercise</td>
<td>Hydrotherapy, yoga, meditation, tai chi</td>
</tr>
<tr>
<td>App: Symptoms</td>
<td>Arthritis, pain</td>
</tr>
<tr>
<td>App: Mental health</td>
<td>Smiley face meter, stress reduction (sounds of country)</td>
</tr>
<tr>
<td>App: Additional items</td>
<td>Somatic map, stool chart graphics, recipes, food plate builder, incentives, alerts</td>
</tr>
<tr>
<td>Program: Digital info</td>
<td>Exercise, Healthy Mind, Keeping Safe, Managing Medications, Preventing Health Conditions, Healthy Eating, Foot Care, Music</td>
</tr>
<tr>
<td>Program: Messages</td>
<td>Deadly Tips from WIO workbook plus suggestions</td>
</tr>
<tr>
<td>Portal: Client info</td>
<td>Program checklist, Auntie/Uncle titles</td>
</tr>
<tr>
<td>Working name</td>
<td>Healthy Mate</td>
</tr>
</tbody>
</table>

Modifications in italics will be implemented in future versions.

In terms of the look and feel of the app, suggestions were made for colour variation, to more easily differentiate between list items; a preference for icons as used in the android version, over the word-centric Apple version; audio messages for those who are hard of hearing; large text and matching colour schemes to nature.

Uptake of the technology varied across the two sites

At both sites there were participants who were keenly interested in the technology and its potential to facilitate their health journey, and there were participants who were more ambivalent about the technology and its uses. Some of the latter participants did not feel that they were familiar enough with smartphone use to benefit from an electronic health diary. This sentiment was most strongly expressed in the Woolloongabba location. Of the seven participants WIO, only three made more than four entries over the 12 week WIO cycle. One of these participants was a consultant for CSIRO, who was eligible for the WIO program. In contrast, of the 11 Gold Coast WIO participants, eight participants made four or more entries over the WIO cycle, with four participants making regular use of the app (over 100 entries each during the 12 weeks). Across both sites, measurements directly related to WIO (ie those taken during the WIO sessions) were most likely to be entered into the health diary (Figure 2).
Figure 2. Gold Coast Work It Out participants made more entries than those in . Measures taken during WIO sessions including blood pressure (BP), blood sugar (Glucose), heart rate (HR) and oxygen saturation (O2) as well as exercise were more likely to be entered into the health diary than lifestyle factors.

Based on these results, only those participants at Woolloongabba who expressed strong interest in the project were offered the upgraded platform. All Gold Coast WIO participants were invited to participate.

Results have the potential to influence behaviour

Preliminary results from the current trial suggest that insights into how lifestyle factors interact with health measures have the potential to influence health behaviours. When stress levels for one participant were plotted against ‘treats’ no relationship was observed, suggesting that this participant is not a ‘comfort eater’. When however, stress was plotted against mobility derived from the phones’ pedometer, a positive relationship was seen where stress levels increased as steps per day increased (Figure 3). This allowed the participant to examine their routine to determine if moving about made them stressed; or if stress made them agitated and more active. The participant felt the former was more accurate, which allowed them to then accommodate rising stress levels by scheduling a relaxing evening after busy days so as not overwhelm themselves with activities. The trend line suggests that overall, the participant’s stress levels have reduced over the course of the program, and this parallels their own, and the exercise physiologist’s, observations of improved mobility.

Figure 3. For this participant, there is no association between treats and stress levels during the six week period examined (top), suggesting that this participant is not a ‘comfort eater’. There is, however, an association between stress levels and mobility, although the direction of the relationship is not known.

Discussion

The relationship IUIH and WIO had developed over several years with Aboriginal and Torres Strait Islander people in metropolitan areas facilitated CSIRO engagement with WIO participants to determine how the technology could meet their needs for tracking health related factors. Together with engagement with IUIH staff to determine which aspects of the paper-based program material could be made digital, the whole platform was adapted to develop a culturally sensitive technology to augment self-determination in current programs for chronic health management.

During the project it become apparent that Aboriginal and Torres Strait Islander people view health in a number of different ways and that health technology will be more appropriate for some people than others. The strong intellectual investment from the WIO participants demonstrated the importance of Indigenous ownership and voice in developing culturally appropriate technology and that modifying existing technology requires a high level of attention to detail to ensure that every nuance of the technology is appropriate. For example, two weeks prior to the end of the final trial period, the researchers noticed that when adding participants to the portal the options for title were the standard Mr, Mrs, Ms, Miss. And yet, Aboriginal and Torres Strait Islander people across Australia commonly identify with the titles Auntie (or Aunty) and Uncle. This glaring oversight of such small but incredibly meaningful customisation highlights both the simplicity and complexity of cultural adaptations.
One of the most exciting aspects of working in this space was the original thoughts that arose through discussions with the WIO participants. Their desire to improve awareness of how their emotions and lifestyle factors contributed to their health resulted in the more innovative elements of the technology, such as the interactive food plate. Hence, the ‘wish list’ for future technology is long and includes improvements for the look and feel of the app with preferences colours of nature; incentives; such as messages from key Indigenous role models on achieving goals; stress reduction including sounds of country; and alerts including their personal favourite, having the phone send a message saying “I haven’t moved for the last X hours..have you?”.

Some of the most animated discussion was around what to call the working version of the app, with participants in both locations focusing on the mateship of the WIO program, and how working together formed an integral part of their positive health journey. Their success suggests that ‘Healthy Mates’ is also perhaps the best concept to underpin collaborative research to enhance Indigenous health autonomy.

The project demonstrated that technology be implemented into existing health programs to support urban Indigenous people in managing their chronic conditions if it is directed by and owned by them and developed under collaborative conditions.

**Acknowledgements**

We thank all the WIO clients; the gyms (Quany’s, Human Performance Centre and Anytime Fitness); Jim Walker; IUIH staff including Katrina Lewry, Samara Dargan, and exercise physiotherapists, especially Mitch and Binh; and CSIRO staff Cath Daly, Karen Harrap and Derek Ireland. This project was funded by Queensland Health.

**References**


Appendix C Developing Northern Australian Conference 2017

Paper submitted to Developing Northern Australian Conference, Cairns 2017
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Podcast: http://www.authorstream.com/Presentation/EventsPP-3182789-1200-bradford-basit/
Citation: Bradford, D and Basit, T (2017) Cultural knowledge and technology: Collaborations to enhance Indigenous health autonomy. Proceedings of the 2nd Developing Northern Australia Conference, Cairns.

Cultural Knowledge and Technology:
Collaborations to Enhance Indigenous Health Autonomy

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Paper Presented at the
Developing Northern Australia Conference
Cairns (QLD), 19-20 June 2017
ABSTRACT: Indigenous health providers are best placed to improve health outcomes for Aboriginal and Torres Strait Islander people. Since 2009, the Institute for Urban Indigenous Health (IUIH) have made significant inroads into Aboriginal and Torres Strait Islander health through successful initiatives like Deadly Choices and the Work It Out program. At the same time, CSIRO’s eHealth Research Centre has been developing platform technologies to broaden accessibility to health programs and enhance health autonomy. In 2015, IUIH and CSIRO formed a collaboration to co-develop a platform technology to deliver a digital program for health and chronic disease self-management through the existing Work It Out program. The relationship IUIH has developed over several years with Aboriginal and Torres Strait Islander people in metropolitan areas facilitated CSIRO engagement with Work It Out participants to determine how the technology could meet their needs for tracking health related factors. Concurrent with the engagement, staff from CSIRO and IUIH met to determine which aspects of the paper-based Work It Out program material could be made digital. Following this consultative process, the tailored technology was trialled in two Work It Out locations, in two phases, with the initial phase trialling health measure tracking and the second phase covering both health measure tracking and the digital education program. Results from the preliminary trial suggest that the technology is more appropriate for some locations than others, and that participants are most interested in tracking those health measures that are directly related to the Work It Out program, such as blood pressure, heart rate and blood sugar. Participants reported that advantages of the health diary included a greater awareness of factors contributing to their health and the ability to show their GPs accurate records of their health data over specific timeframes. This project has demonstrated that ehealth technology can be used to augment existing Indigenous health projects.

Keywords: Aboriginal and Torres Strait Islander, Indigenous, Health Autonomy, Platform Technology, Participatory Design.

Introduction

If health initiatives are led by Indigenous health providers, Aboriginal and Torres Strait Islander people are most likely to gain positive health outcomes. Yet most technology enabled services are designed for the general population. To date, there have been few trials of culturally appropriate, health related phone or portable technology apps for Aboriginal and Torres Strait Islander communities. As such, little is known about the effectiveness, accessibility and acceptability of this technology in this population. Two trials have been conducted with mental-health apps, both of which were developed with extensive community consultation; the AIMhi Stay Strong app (Dingwall et. al., 2015), and the ibobbbly suicide prevention app (Tighe et. al., 2017, Shand et. al., 2013). Whilst the use of apps were found to be both acceptable to the participants and feasible in reducing mental health symptoms, they were targeted only at Indigenous youth (aged 18-35) in rural and remote communities (Povey et. al., 2016). Furthermore, while mental health has been found to be the largest contributor towards Indigenous burden of disease (Vos et al., 2009, Zhao & Dempsey, 2006), lifestyle factors such as smoking, physical inactivity and diet contribute to increased rates of coronary heart disease (CHD) and diabetes. Both CHD and diabetes are largely responsible for the life expectancy gap present between Indigenous and non-Indigenous Australians (Vos et al., 2009; Zhao & Dempsey, 2006; Begg et al., 2014).

The Institute for Urban Indigenous Health (IUIH) was established in 2009 by integrating four Aboriginal and Torres Strait Islander Community Controlled Health Services. IUIH leads the planning, development and delivery of comprehensive primary health care to Indigenous communities in South East Queensland (SEQ), with a current regional network of 18 multidisciplinary primary health clinics, servicing approximately 30,000 people. In order to facilitate further expansion of services, secure ongoing delivery of programs and increase community support networks, IUIH works in partnership with like-minded organisations to achieve the goal of improved primary health care access for urban Aboriginal and Torres Strait Islander people in SEQ. One of these partnerships has been with CSIRO.

CSIRO’s Australian eHealth Research Centre (AEHRC), a Joint Venture with Queensland Health, has strong capability in developing platform technologies to facilitate and enhance e-health services. One such technology is the first clinically validated mobile delivery of cardiac rehabilitation (CR) services through a
platform technology comprising a clinical portal, and a CR information, mentoring and motivational program delivered through smartphone app that included a health diary. Compared to traditional clinic-delivered services, the smartphone-delivered CR program improved uptake, adherence and completion rates of rehabilitation in CR patients, as well as performing equally or better than in health outcomes (Varnfield et al., 2012). This technology was then modified in 2015 to address awareness of heart disease and access to services in Aboriginal communities (Bradford et al., 2015). As part of these modifications, AEHRC consulted with IUIH to incorporate the views of Indigenous health providers into the platform modifications. During these consultations it was determined that a similar platform technology could augment IUIH’s Work it Out (WIO) Program, a chronic disease self-management program conducted with metropolitan Aboriginal and Torres Strait Islander adults.

In this paper we discuss the three phases of the project – the engagement phase with both WIO clients and IUIH staff, the initial trial of the health diary delivered through a smartphone app and the second trial incorporating the WIO program and health diary delivered through the app. We describe some of the modifications that were made to the technology following engagement period, usage results from the initial trial in which the modified health diary was implemented, development of the digitised WIO program and preliminary results from the second trial which encompassed further modifications to the health diary and the digital WIO program.

Methods

This project was conducted as an amendment to an existing project, with approval from the University of Queensland’s Institutional Human Research Ethics Committee (2011001283) and reciprocal approval from CSIRO Health and Medical Human Research Ethics Committee (12/2016).

Work It Out Program

The WIO program is an exercise and education program for Aboriginal and Torres Strait Islander people diagnosed with, or at risk of, a chronic disease. It applies self-management concepts using a culturally responsive and holistic framework, and aims to empower and build confidence in participants to self-manage their health, enhance independent functioning, and improve physical and psychosocial health outcomes. It is run at 15 sites across South East and Central Queensland. Each session runs for two hours, 2–4 times a week (site-dependant) with groups of 6–20 participants. The exercise component is held in a gym, and consists of individually-tailored exercise in a group setting prescribed and supervised by an exercise physiologist. The education component of the program is delivered by a range of allied health professionals including dietitians, psychologists, pharmacists, and occupational therapists, some of whom are Aboriginal and some are non-Indigenous. Each session ends with 15 minutes of tukka (sandwiches) in an informal and social setting. Work It Out runs in 12 week consecutive cycles throughout the year. Once a participant enters the program, they may continue attending consecutive cycles as long as desired, which caters for absences due to illness or cultural and/or family commitments.

Platform technology

The platform technology comprises three elements – the clinical portal which holds the participants’ data, the health program comprising multimedia health information and health devices and the smartphone app (Apple and Android) through which the program is delivered and which houses the health diary (Figure 1). Program components include multimedia material, motivational messages, mentoring and goal setting, and educational resources. The health diary is used to record metrics associated with lifestyle factors (alcohol, cigarettes, coffee, sleep, stress, steps, fruit and vegetables) and health metrics (blood pressure, heart rate, blood sugar, height, weight). Users can also enter data relating to exercise and symptoms.
Participants and Procedure

Engagement with two groups of WIO participants (Woolloongabba and Gold Coast, n=23) (Table 1) was conducted through yarning (an informal and conversational approach to sharing information and gathering thoughts, views and opinions in line with Aboriginal and Torres Strait Islander values). During yarning, the platform technology was introduced, demonstrated and discussed in detail. Several WIO sessions were attended by researchers over a 12-week WIO cycle to obtain perceptions and criticisms of the technology. Participants were not offered incentives, although a buffet-style lunch was provided following the engagement period, and clients who wanted to participate but were prevented by not having a smartphone were given a smartphone to use and keep after the trial (Table 1).

| N=23 |
|---|---|
| Age range | 31–81 |
| Gender | F=15; M=8 |
| Identify as Aboriginal or Torres Strait Islander | 20 |
| # with diagnosed chronic disease or condition | 21 |
| # with risk factors | 22 |
| # with compatible smartphone* | 20 |

* The other three participants were given smartphones to allow them to participate.

IUH exercise physiologists, program and design staff were also given an opportunity to provide feedback in an initial meeting and over the 12-week engagement period. Ongoing engagement with the two exercise physiologists responsible for the relevant WIO sites as well as program development and design staff was conducted in an iterative process throughout the course of the ensuing trials.
Trialling the suggested modifications

During the engagement period, health measures and exercise options pertinent to the participants were identified. These were incorporated into the platform technology at the end of the engagement period. At the commencement of subsequent WIO cycles, participants expressing interest in using the app (n=17) were given access to the app and instructions in its use. During this time, a digital version of the WIO education program and additional diary functions were developed and incorporated prior to the second trial conducted with predominantly Gold Coast clients (n=16) and one Woolloongabba client. Some of the clients ended their participation after the first trial, and some clients began participation in the second trial, hence the total number of participants (N=23) is greater than the number in each trial (n=17). Researchers regularly attended sessions during the two implementation trials to obtain feedback and assist with any technical or operative difficulties.

Results

Due to the solid relationship IUIH had established with WIO clients over the preceding four years, CSIRO researchers were welcomed in both locations. Most clients showed interest in the research, with some keen to try the technology to facilitate their own health management practices, while others felt it wasn’t suitable for their personal needs. This latter position was most prevalent at Woolloongabba, and tended to be in response to the device itself, rather than the concept of supporting their health journey. That is, clients felt they weren’t familiar enough with the use of smartphones and associated applications to get sufficient benefit from an interactive diary. Even so, they contributed their thoughts for potential modifications.

Additions were made to the health diary

Modifications to the health diary are detailed elsewhere (Bradford and Basit, et al., submitted) and include additional health measures like treats, massage and digestion; additional exercises undertaken by clients such as hydrotherapy, yoga, tai chi and meditation; and additional symptoms including arthritis and pain. In response to a request to monitor mental wellbeing, a smiley face rating was included (Figure 2), with a provision to add notes.

![Figure 2: Smiley faces give a rating for monitoring mental wellbeing.](image)

Some of the additional features suggested by participants were beyond the scope of the current platform development, but were recorded for future versions. These included monitoring of medications, stress reduction resources such as sounds of country, incentives and alerts.

Technology uptake was variable across the two sites

During the first trial of the health diary, delivered through the smartphone app, WIO clients in the Gold Coast (n=11) used the technology to greater degree than the Woolloongabba clients (n=6) (Figure 3).
Excluding participants with zero entries (n=3 at the Gold Coast and n=2 at Woolloongabba), mean number for entries per person was 76 compared to 33.25 respectively, with four clients at the Gold Coast making over 100 entries each. Due to these differences, the second trial, consisting of the updated health diary and digital education program, was offered to all Gold Coast clients, and only those Woolloongabba clients who expressed strong interest.

In both locations, participants made more entries associated with metrics that were taken as part of the WIO program, including blood pressure, heart rate, exercise and blood glucose (for clients managing diabetes), than they did for other lifestyle factors such as coffee and water intake, or sleep and stress assessments (Figure 3). There may have been a reluctance by participants to enter data for variables like alcohol, smoking, coffee, water, as it may have been perceived as causing some embarrassment (shame) to the individual due to a perceived potential for judgement from those reading the data (IUIH and CSIRO).

Figure 3: Gold Coast participants made more health diary entries than Woolloongabba participants, with clients in both groups more likely to enter metrics directly associated with the Work It Out program, than those associated with other lifestyle factors.

Digitising the paper-based program

While the participants were trialling the health diary delivered through the smartphone app, the digital version of the WIO program was under development. The paper-based WIO program was currently delivered through a large, beautifully illustrated workbook, not all of which was suitable for delivery through the smartphone app.

It was decided to incorporate components of eight topics (Exercise, Healthy Mind, Keeping Safe and Active in Community, Managing Medications, Preventing Health Conditions, Healthy Eating, Foot Care, Music) that would reinforce the information session given face to face during the WIO cycle and provide a resource for clients at home.

Clients were particularly interested in app components associated with nutrition

Most clients expressed an interest in food intake and nutrition. During the WIO cycle, a dietitian would yarn about food plates, giving information of serving sizes and recommended daily intake of different food groups. The session would include a cook up demonstrating how to modify a recipe (recipe renovation) to make meals as healthy as possible (Figure 4).
Digital Technology to Support the Work It Out Program

Given the strong interest in nutrition, it was important to ensure that the digital program and smartphone app provided participants with all the resources they required to facilitate healthy eating and allowed them to record specific measures of interest. For this reason, the Healthy Eating section of the digital program included a wealth of resources on food groups, eating plans, tips to prevent over eating, fats, carbohydrates and a glycemic index, recipe renovations and information on food labels, all taken from the WIO workbook. In addition, an interactive food plate was developed so that participants could record the number of servings of each food group they had over the day (Figure 5). Alternatively, if they were only interested in increasing their fruit and/or vegetable intake, they could use the health diary to monitor how many serves of fruit or vegetables they had.

Adding the motivational component

A final component of the health program delivered through the smartphone app was the motivational content. The platform technology sends sms messages pertinent for each week of the program it is designed to deliver. For the WIO program, it was decided to use the deadly tips that punctuate the WIO workbook (Figure 6) (‘deadly’ is Aboriginal English for ‘excellent’ or ‘awesome’). Forty-three deadly tips, related to all aspects of the program were derived from the WIO workbook, and an additional nine messages were suggested by participants (Table 2). Clients were quite creative when it came to devising new messages for delivery, but not all their suggestions could be included. For example, one client suggested that the pedometer on the smartphone could be utilised for motivation. If no activity was recorded for an extended length of time, a message could appear saying “I haven’t moved for X hours, have you?” This idea, while an exemplar of the wit of the clients, was beyond the scope of the current platform development. Instead it was agreed that the message ‘Don’t forget to move around if you’ve been sitting for too long!’ could be incorporated into the messages relating to ‘Physical Activity’ (Table 2). The 52 messages were delivered throughout the 12 weeks of the WIO cycle, at a rate of about four per week, in the week most applicable to the program being delivered. This rate was chosen to prevent ‘message fatigue’ from receiving too many notifications.
Figure 5: An interactive food plate was developed for WIO participants who wanted to record their food intake against recommended daily food group consumption. Alternatively, the health diary allowed monitoring of specific food groups, such as vegetables. Graphs show adherence to recommended servings over time.
Feedback from the clients

Throughout the project, researchers yarred with clients about the features they liked and didn’t like about the platform. Negative feedback was generally in regard to the amount of data that needed to be entered and the difficulty of entering data when they weren’t familiar with the smartphone. Some felt their memory was a barrier, as they forgot to bring their phone to the gym, and then once home forgot to enter their measurements. Positive feedback was received around the usefulness of having physiological records that they could show their GPs. At one yarning session, researchers showed how data from different variables could be plotted together to determine relationships. In the example used, a relationship between stress and mobility was noted for a client who was recovering from a stroke (Bradford and Basit, submitted). This information provided the client with insights into the toll mobility increases had on her stress levels and allowed her the opportunity to plan her days such that her mobility could be kept to a level with which she was comfortable.

Table 2: Examples of motivational messages taken from deadly tips and participant suggestions.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Motivational message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily living routine</td>
<td>Do you fellas know why routines are important? Help you remember things like taking your medication; Can give your life structure; Help you to handle unexpected changes; Help you to achieve your goals!</td>
</tr>
<tr>
<td>Goal setting</td>
<td>Come on Mob, Let’s keep our passions alive! Tell me your dreams... Are they different to todays? Let’s make a game plan so you can work towards your dreams. Talk to your health staff about things to add to your game plan</td>
</tr>
<tr>
<td>Reading food labels</td>
<td>When reading the ingredients list look for sugar or fat listed in the first three ingredients. This can sometimes tell us that the food is not the best option.</td>
</tr>
<tr>
<td>Physical activity</td>
<td>Don’t forget to move around if you've been sitting for too long!</td>
</tr>
<tr>
<td>Stretching</td>
<td>Stretch 2-3 days per week to increase flexibility</td>
</tr>
<tr>
<td>Client suggested</td>
<td>Do you need to drink more water today?</td>
</tr>
<tr>
<td></td>
<td>Have you gone for a walk today?</td>
</tr>
<tr>
<td></td>
<td>Don’t forget to move around if you've been sitting for too long!</td>
</tr>
<tr>
<td></td>
<td>Try and limit how many sweets you eat.</td>
</tr>
<tr>
<td></td>
<td>Remember to eat breakfast!</td>
</tr>
<tr>
<td></td>
<td>Try and limit how much food you eat after 8pm.</td>
</tr>
<tr>
<td></td>
<td>Don’t forget to record your daily health measurements!</td>
</tr>
<tr>
<td></td>
<td>Do you know how big a ‘serving’ is?</td>
</tr>
<tr>
<td></td>
<td>Why are you looking in the fridge?</td>
</tr>
</tbody>
</table>
Discussion

The strength of this project lay in the willingness of clients to work with researchers to develop a useful technology developed in line with cultural protocols that recognised the value of the input by Aboriginal and Torres Strait Islander people. Several modifications were suggested during the engagement phase, many of which were incorporated into the technology for trial. Engagement with IUIH staff and clinicians resulted in development of a digital version of the WIO program that can be employed through the smartphone, and/or used as a resource by IUIH. In trialling the platform, it was found that those participants that were willing and able to enter data received value out of the technology, in terms of developing a greater understanding of the personal factors that impact their health and in having a record of physiological data for health service providers.

How to improve uptake of eHealth technologies

Uptake of the technology differed across the two locations, with a higher use recorded at the Gold Coast than by Woolloongabba clients. This could be explained by a younger, on average, cohort at the Gold Coast, or by a higher aptitude for online technologies. Prior to commencing this project, WIO clients at the Gold Coast had raised the idea of augmenting the program with online technologies such as social media platforms. During the engagement phase, several of the Gold Coast clients were quite passionate about the refinements of the technology and the potential benefits that could be realised through incorporating monitoring of lifestyle factors such as mental wellbeing and food intake into their chronic health journey. Those that offered the most suggestions went on to use most aspects of the app, and in turn, received the most benefit from the technology. This clearly demonstrates the value of input and ownership in developing technologies for use by people managing a chronic health condition.

Much of the reluctance to use the technology came from lack of familiarity with smartphones and associated apps. This could be circumvented by formally incorporating a training phase into the engagement period, where participants were actively engaged in learning to use all aspects of the smartphone required for participation. While some such training was offered on a casual basis, many of the participants either did not bring their phones to the gym, and/or did not wish to come earlier to participate in training prior to their WIO session. Younger participants were more accepting of the technology, suggesting that uptake of eHealth technologies will improve over time.

While the Woolloongabba participants may not have input as much data as is required to consistently and effectively monitor their respective conditions, they spoke about how they could see the benefit of the app in the monitoring of health metrics and chronic disease symptoms. Input to the app may have increased if its use was also actively encouraged from multiple sources, such as the local GPs or medical services. During the trial periods, various medical specialists only gave limited recognition of the records kept on the app. Involving the Aboriginal medical service in the project at both the development and implementation phases would positively contribute to the regular use of the app by participants and allow medical specialists to recognise the value of the app for monitoring health metrics, particularly in clients with chronic health conditions.

Conclusion

This project demonstrated that it is possible to modify existing technologies to augment programs designed for Aboriginal and Torres Strait Islander adults managing chronic health conditions. By following appropriate cultural protocols that recognise the value of input from Aboriginal and Torres Strait Islander people themselves, and working closely with Indigenous health providers, Aboriginal and Torres Strait Islander adults were provided an opportunity to refine a technology to augment their existing health program to suit the needs of their chronic health journey.
Acknowledgements

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References


Digital Technology to Support the Work It Out Program

Appendix D NHMRC Conference 2017


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Healthy Mates: Collaborations to enhance Indigenous health autonomy

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Background
Positive health outcomes for Aboriginal and Torres Strait Islander people are most likely to arise from programs led by Indigenous health providers and supported by key stakeholders. Currently, most technology-enabled services are designed for the general population, with few trials of culturally appropriate, health-related mobile technology apps for Indigenous communities. In 2015, CSIRO and IUIH formed a collaboration to modify an existing platform technology developed by CSIRO to deliver a digital version of the Work It Out (WIO) program, an information and exercise program for chronic disease self-management delivered by IUIH.

Objectives
To develop a culturally appropriate technology to augment the WIO program and enhance health autonomy in participants.

Method
Two groups of participants were consulted during a 12-week engagement period and two 12-week trial periods. The first group comprised WIO clients. All attending clients were eligible for the study and included in yarning. The second group of participants comprised IUIH staff including exercise physiologists and those responsible for program development and design.

Results
Results from the initial trial suggest that the technology is more appropriate for some participants than others, and that participants are most interested in recording those health measures that are directly related to the WIO program, such as blood pressure, heart rate and glucose. Participants reported that advantages of the health diary included a greater awareness of factors contributing to their health and the ability to show their GPs accurate records of their health data over specific timeframes. Existing Indigenous health programs can be augmented by e-health technology.
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