SMARTPHONE-BASED PROBLEM GAMBLING

EVALUATION AND TECHNOLOGY TESTING

INITIATIVE ('SPGeTTI')

Final Report

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Prepared for:

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Prepared by:

Gayl Humphrey
Chris Bullen

National Institute for Health Innovation (NIHI)
Auckland UniServices Ltd
The University of Auckland

Confidentiality

Citing this report

Acknowledgement

Contact details:
Professor Chris Bullen (Principal Investigator)
National Institute for Health Innovation (NIHI)
Faculty of Medical and Health Sciences
University of Auckland
Private Bag 92019
Auckland, New Zealand
Phone: +64 9 3737 599
Email: c.bullen@auckland.ac.nz

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Executive Summary

This report presents the findings from the SPGETTI (Smartphone-based Problem Gambling Evaluation and Technology Testing Initiative) study. This study built on earlier formative work exploring the potential of a smart phone app using geo-positioning technology to deliver a behavioural support programme with the added feature of a "just-in-time" intervention to deliver an intervention at a high risk moment.

The original aim of the study was to test the effectiveness of a smartphone application that supports people with a gambling problem, specifically on Electronic Gambling Machines (EGMs or 'pokies'), to avoid relapse and remain abstinent using a randomised control study design. However, during the course of the study a number of problems arose. These problems can be described under two main categories - participant recruitment and technology. Significant effort was undertaken by the research team to mitigate these issues and find solutions.

An initial review was undertaken and changes in the participant eligibility and recruitment flow were changed and further refinement on the app was undertaken, specifically the geo-positioning functionality. Despite these changes, recruitment remained a significant issue, with less than 17 participants referred to the study by Auckland based gambling support service providers, by the recruitment close date.

Further discussions were undertaken with the study Advisory Group, and gambling service providers, to explore strategies to increase recruitment The conclusion of these discussions were that a new study design and methodology was needed. A prospective cohort and evaluation study was identified as the best design methodology. To maximise engagement and minimise potential barriers of access, all interactions with participants for the study would be undertaken through the app, recruitment would be self-referral and feedback would be multimodal. A full recruitment and promotional plan was developed to accommodate the different recruitment methods. These changes were proposed and accepted by the Ministry of Health in November 2017.

The new study ran from January to September 2018. It was advertised and promoted across an array of media types and while feedback of participants tended to favour Facebook as the primary place they heard about the app, the human interest stories in Stuff News and the Indian News online, had the most noticeable impact in terms of the relationship to download. A varied study recruitment promotion modalities were implemented such as Facebook, Google Ads, Twitter, LinkedIn, targeted media material including human interest stories, posters, and presentations at community settings. Regular updates using refreshed images and wording were maintained throughout the study period. This multimodal approach was developed in response to the evidence and experience of the researchers related to the difficulty in recruiting people experiencing gambling harms. Reasons for this include that gamblers may be too involved in the activity itself to consider they have a problem, or may feel whakamā (guilt and/or embarrassment) at being thought of as having a problem and for those who would be categorised as having a moderate risk of harms protesting that they are only a "social player".

Disappointingly, but not entirely unexpected our recruitment numbers remained low. Over the study period we had a conversion rate (consented to participate) of 39% which reduced to 23% when completed baseline measures were accounted for. By the end of the study we had a completion rate of 4%. Not unexpectedly, 61% were male and were aged between 30-60 years of age. The majority of participants were New Zealand European although there were a few Māori and Samoan. The majority of the participants had Gambling Symptom Assessment Scores (G-SAS) within the Moderate Harm category. One participant showed a reduction in their G-SAS from 31 (Severe Harms) to 24 (Moderate Harms), suggesting that for this individual, their experience and reporting of gambling problems had reduced.

The geo-positioning feature identified nine individuals who were in an electronic gaming zone. Issues with the phone location feature being turned off, or being in a venue where the geo-positioning signal was lost and the comment that for some the battery drainage was noticeable, are factors that suggest that the robustness of this technology being used for this purpose is still in its infancy. Notwithstanding this, for one participant the geo-positioning triggered notifications were viewed at each occasion and appeared to have an impact on the length of time spent in a gambling zone. Until this technology improves on smart phones this technique is likely to remain problematic, however the potential of combining real time and location with triggered notifications continues to have potential for supporting behaviour change.

Feedback by participants in the study and from the focus groups at the end of the study period continue to highlight a high interest in apps as a tool for supporting people experiencing harms from gambling. Issues such as privacy and whakamā (shame) emerged with regard to others seeing the app on their phone and possibly finding out that the person had a gambling problem were mostly mitigated by the use of an app name – SPGeTTI - which has no clear connection to gambling. Any future smart phone app developments of this sort would also need to consider app naming in light of this finding.

 The focus of the SPGeTTI study was to provide an avenue to support amongst mild/moderate problem gamblers who were least likely to access current services. However the researchers were not successful in recruiting participants despite extensive attempts and strategies. As participants with significant gambling problems were identified as willing to participate in focus groups, these were arranged. As such, members of the focus groups were all problem gamblers with significant other co-morbidities including substance abuse. To somewhat mitigate the impact of the participants current problem gambling severity, the researchers set the scene of the conversations to one of reflecting back on the gambling journey. Participants were asked to visualise a time when an intervention such as SPGeTTI might have been timely for them in terms of signalling they had a gambling problem. While the content of routine and Just-In-Time notifications were remarked on as somewhat "tame", they all confirmed that they thought that the regular messages were well shaped for people who were experiencing mild to moderate harms. Not all agreed, but many suggested that these tools might have slowed their potential decline into greater gambling harms. Others were less sure, signaling that they felt they had to "hit bottom" before they could start to recover. There was positive support that these tools needed to reflect the culture and language of people impacted by harms and that the addition of the Chinese translation was positively viewed despite its failure to attract participants.

In conclusion, the acceptability of the mobile smart phone as a support tool was confirmed in this study but the diversity of these tools and their varying operating systems was underestimated. This resulted in notable limitations and issues of implementing the geo-positioning triggered notifications which arguably was a factor in the retention of participants. Nevertheless, the difficulty in gaining participants was a significant factor. Other research in this field has found similar difficulties, with the promise of canvasing directly to possible participants, while successful in other studies, is clearly not a panacea for recruiting people experiencing gambling harms. Despite this the influence of human interest stories as a catalyst for gaining interest should not be underestimated. While the potential of SPGeTTI was not realized the lessons that emerged will certainly influence future developments of mobile apps and in form future recruitment strategies.

1 Introduction

In 2016 the Ministry of Health (MoH) contracted the National Institute for Health Innovation (NIHI), Auckland UniServices Ltd. to explore and develop a mobile phone-based application ("app") that could support people experiencing harms from gambling. A formative piece of work, also funded by the MoH, was undertaken in 2015 to ascertain what the features and functions of an app would users want, as well as test the feasibility of incorporating a geospatial positioning system (GPS) that could respond "Just-in-time" with an intervention to dissuade the participant from staying within a gambling zone. The findings of this work are reported separately.[1]

Using the outcomes of the formative work NIHI was funded to develop the app further and to undertake and complete a study of the effectiveness and acceptability of the SPGeTTI smartphone application (app) for reducing gambling harm amongst moderate/problem risk gamblers.

This report presents the stages and findings of the study.

2   Background

Gambling-related harm is a significant public health problem in New Zealand.[2] The most recent National Gambling Study (2012) utilised the Problem Gambling Severity Index (PGSI) to measure rates of problematic gambling.[3]   The survey found that 0.7% of adults met the past-year criteria for problem gambling and were experiencing significant problems associated with their gambling. An additional 1.8% of adults were experiencing some gambling-related harms and met the criteria for moderate-risk gambling. A further 5% were categorised as low-risk gamblers, meaning that they were experiencing a few gambling-related problems but at risk of progression to moderate-risk and problem gambling. An increased risk of lifetime gambling problems was associated with being male, identifying as being of Māori or Pacific ethnicity, being aged 25-34, and living in a household with five or more people.[4] An analysis of the 2011/12 New Zealand Household Health Survey data by Rossen et al. found that 3.2%, or an estimated 112,800 adults, were experiencing some level of harm and/or negative consequences as a result of their gambling; 0.2% satisfied the PGSI past-year criteria for problem gambling, 1.0% were categorised as moderate-risk and a further 2% satisfied the criteria for low-risk gambling.[5]   These estimates are lower than those obtained by the National Gambling Study possibly due to methodological differences.

Current Gambling Support

Traditionally, individuals seeking help for gambling-related issues are at the higher harm acuity scale and have obtained and received treatment from general physicians or specialised counselling services. These treatment interventions are mostly delivered face-to-face, can be individual or group delivered and involve a series of sessions. Barriers to face-to-face treatment include cost, geographical isolation, and inability to attend repeated individual or group sessions due to timing, transport or conflicting commitments, fears of stigmatisation and privacy concerns. However, fewer than 10% of people with problem gambling are in treatment at any one time,[6,7] with most seeking treatment only in response to a significant life crisis.[8] As a result, significant proportions of people experiencing gambling harm across the spectrum of severity are without treatment and often without flexible treatment options.

Over recent years there has been an exponential growth in the delivery of self-directed interventions and in particular those delivered via the internet.[9,10]   Internet-delivered interventions go some way to addressing the common barriers to help-seeking.[11] Some problem gamblers find internet-delivered interventions are attractive because of their convenience and ease of access.[12] They are also low cost, immediate, and enable self-management. Dowling and colleagues recently concluded a pragmatic randomised controlled trial in Australia ('GamblingLess') that examined an online CBT programme delivered without any practitioner guidance (pure self-directed: PSD) and delivered with practitioner guidance (guided self-directed: GSD).[13] There were statistically and clinically significant reductions in gambling symptom severity, urges and psychological distress within treatment groups at the 2- and 3-month evaluations. These findings confirm the effectiveness of both PSD and GSD interventions but suggest that the addition of guidance does not improve outcomes for self-directed interventions.

While the role of Internet-delivered interventions is showing promise, there are limitations to its use. These are similar to other online learning programmes[14] where access to and competency with the required technology, and participant readiness to change and be self-directed, all contribute to low uptake and often high dropout rates.   Similar potential limitations were identified and reported in the Australian GamblingLess study.[13]

The Opportunity of Mobile Phones in Addiction Interventions

With the growth of smartphone ownership expected to reach 90% by 2019 [15, 16] and with the new capabilities such as GPS, augmented and virtual reality, sensors and biometric authentication, it is difficult to ignore the role these mobile digital devices can play in the addiction intervention space. The role of applications (apps) also can not be underestimated. According to the Business of Apps and The Statista Portal, in 2017, consumers downloaded 178.1 billion mobile apps to their connected devices and 3.7 billion were mobile health apps.[17] While this signals that apps are tools that people want, like and download there is a corresponding pattern of uninstalls: the average days from the last usage to uninstall for all apps is 5.8 days and only slightly longer at 8.8 days for health apps.[18] The top five reasons that were given in the USA in 2015 for uninstalling apps, were; [19]

1.	I rarely used the app:	72%
2.	Free up memory on my phone:	51%
3.	The app was draining my battery:	44%
4.	I found better apps to replace them:	40%
5.	The app had too many technical issues:	39%

Research is rapidly growing in areas of addiction such as tobacco dependence, where mobile phone messaging interventions have been shown to be effective for a range of population groups, including Māori.[20] Other areas of addiction where apps have been explored are in the field of alcohol[21] and substance use.[22,23] However, there is limited research on apps for supporting people experiencing gambling harms. In one review of addiction recovery apps available on Google Play, the authors found that only five (unnamed) apps of 87 available focused on assisting people to change their gambling behaviour. Only 4.4% (n=2/87) included a clinical or academic advisor in their development.[24] Despite this, the authors found that, where user reviews were possible, the users reported they found the apps helpful in sustaining their behavioural change and supported relapse prevention. While this is promising, there remains a paucity of empirical research evidence on the effectiveness of mobile phone health ('mHealth') interventions for problem gambling.

Gambling Intervention Apps

Two gambling intervention apps from North America and Canada were found that were underpinned by clinical and academic experts in their development. These are the Mobile Monitor Your Gambling & Urges (MYGU) app (http://www.problemgambling.ca/gambling-help/mygu-getmobile/) which was developed by the Problem Gambling Institute of Ontario (PGIO) and an iPhone specific app called iPromises which is developed by the Promises Treatment Centres in the United States. The MYGU app promotes self-awareness of gambling behaviours; i.e., it gathers information about gambling behaviours and reports back to the gambler the date and time they experienced an urge to gamble, triggers for urges to gamble, activities they do instead of gambling, wins and losses when they gambled, feelings and consequences if they gambled or didn't gamble. The app also complements counselling sessions and provides information to therapists. However, there are no published clinical trials.

The iPromises app has trigger alerts, a visual journal, and a directory of phone numbers for support anywhere in the US, Canada, and some international offices. Users can add friends and share meetings, track progress and challenges, and get a daily positive message. It also enables them to track any setbacks, issues or achievements. Similar to the MYGU app, there is no published clinical trial evidence. Further, while searching for recent research (January 2019) this app was found to be no longer available.

A third app is the Cost2Play Calculator (http://www.problemgambling.ca/gambling-help/mygu-getmobile/) which specifically focuses on using information about antecedents to help shape knowledge specifically about money. It is a tool that aims to shift cognition around winning and losing by capturing gambling spends and losses and showing what this actually looks like over the long term. It is developed by the Responsible Gambling Council of Canada which has a research arm that includes clinicians and academics. No research on the effectiveness of this tool for gamblers was found.

In short, the evidence-base behind apps for problem gambling is very limited. The SPGeTTI app described in this report sought to address the issues of these apps as well as to leverage off the remarkable ubiquity of mobile phones to reach and engage large numbers of people anywhere, anytime.

 The following report describes the clinical trial journey undertaken and its successes, difficulties and lessons learnt. Chapter 3 describes the original trial and the development of the study app, the processes undertaken, the findings and the issues identified and experienced. Chapter 4 describes the study redesign and subsequent findings. Chapter 5 discusses these findings.

3 SPGeTTI Randomised Clinical Trial

3.1 Aim

The aims of the SPGeTTI II trial were 1) to develop substantive messaging and other app content that builds on our feasibility study,[1] 2) further refine and field-test the content and technology underpinning the intervention among a larger group of people; and 3) undertake a prospective study and outcome evaluation to test the effectiveness of the app as an adjunct to usual care problem gambling treatment.

3.2 Clinical Trial Study Design

Methodology

A two-arm parallel-groups randomised controlled effectiveness trial was designed to test the hypothesis that the app could have an effect on problem gambling behaviour, in particular, abstinence.

Study population

The study population were adults aged 18 years and over with a current gambling problem primarily involving gambling machines ("pokies"), who were concerned about relapsing and wanted support to prevent relapse, who used an Android or iPhone smartphone capable of accurate location detection, did not have another major co-existing psychiatric disorder (as defined by pre-clinical assessments) and were able to give informed consent to taking part in the study. Participants were required to have been attending a problem gambling intervention service.

The Problem Gambling Severity Index (PGSI) [25,26] is a 9-item self-report measure of problem gambling was used to screen for eligibility. The PGSI is divided into two domains of enquiry, gambling behaviours (four questions) and gambling harms (five questions).   By convention, participants were classified into gambling subtypes based on their PGSI scores as follows: 0 = non-problem gambler; 1–2 = low-risk gambler, 3–7 = moderate risk gambler, 8 and over = problem gambler. In this study, those with a score of 7 and over were invited to take part.

Recruitment

Participants were recruited through problem gambling services in the Auckland region. Problem gambling services provide psychosocial support and clinical interventions for individuals affected by their own or someone else's gambling. The gambling intervention service model recognises that people affected by gambling harm can benefit from a range of services. The model aims to address not only the gambling behaviour, but also to reduce the impact of harm by facilitating the client's access to other services, including:

- financial counselling
- relationship counselling
- other social service agencies
- mental health services

- alcohol and other drug services.

Counselling services are free of charge and available to any person who has a problem with gambling or any person who is affected by someone else's gambling. Access to these services can be self-referral, contact by a concerned whānau/family or friend, or a referral by another agency such as a general practitioner or Justice services.

Eligible clients with a PGSI score of 7+ were identified by each provider, informed of the study by the providers and if the client was interested, an agreement was gained to pass on their details to the research team.

To facilitate the ease of referrals, each provider determined the best recruitment flow process. Figure 1 presents an example of one of the recruitment referral flow of one provider service.
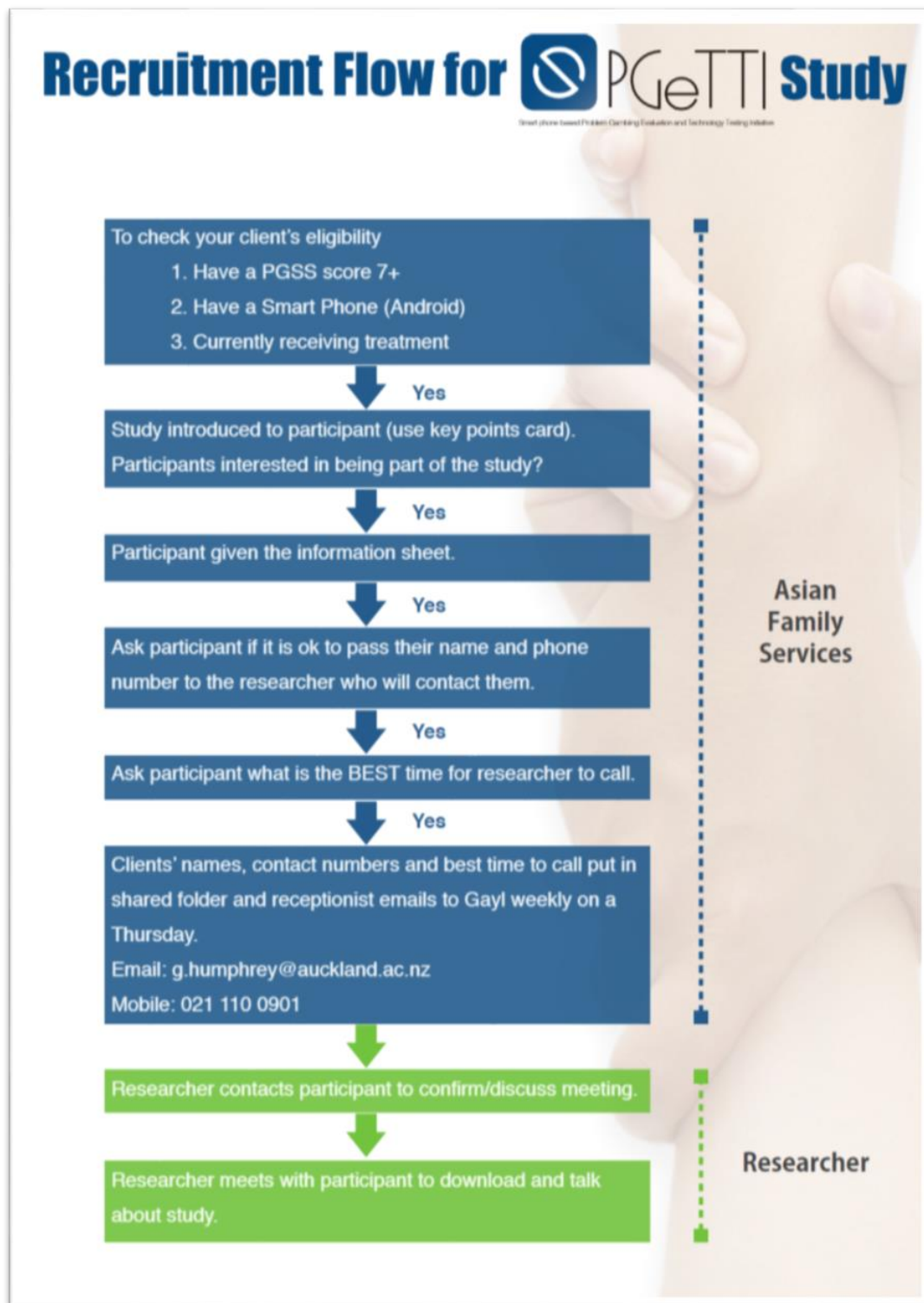
Figure 1. Example of one provider recruitment referral flow process

Screening, randomisation, allocation concealment and blinding

Participants were screened for eligibility by the service providers and referred to the researcher. The researcher contacted the participant and arranged a face to face meeting at a venue in the Auckland region suited to the participant. On completing the baseline data collection including basic demographics, World Health Organisation quality of life tool, WHOQoL[27], and the problem gambling severity index[28] to confirm the level of dependence, the participant downloaded the app. A unique code was provided at this time and using this code, a computerised randomisation sequence was run which assigned the participant to either the intervention or control group. To avoid selection bias, the investigators had no say or visibility of the allocation process or outcome.

Outcome measures

The primary outcome was continuous abstinence at one month from randomisation, validated by geo-positioning.

We measured the number of participants in both arms of the study who were continuously abstinent (as measured by no lapses, with a lapse defined as exceedance of the specified parameters of the 'hot zone': 10 minutes or longer spent within a venue with a gambling machine according to pre-loaded EGM venue location coordinates). All lapses were measured objectively using data collected by the app during the study period.

Secondary outcome measures included the acceptability of the app, its perceived usefulness in preventing relapse, assisting with the goal of achieving abstinence and any unanticipated consequences (such as the participant's not enabling the GPS in the app). During the study, participants were prompted to complete the brief Gambling Symptom Assessment Scale (G-SAS).[29] G-SAS is a self-rated scale that encompasses gambling urges, thoughts, behaviours and interpersonal functions and as such was used as a valid tool for measuring changes in gambling symptoms during and at the completion of the study period. Follow up data was collected via phone call. The G-SAS scores were assigned to categories to signal the extent to which gambling harms were being experienced by the responder (Table 1).

Table 1. G-SAS Score Bands and Harms

Score Bands	Harms Experienced
< 8	None, no harms reported
8–20	Mild harms experienced
21–30	Moderate harms experienced
31–40	Severe harms experienced
41-48	Extreme harms experienced

Sample size

We aimed to recruit, randomise and follow-up for one month 108 participants (a number sufficient to confer 90% power at p=0.05 to detect a difference of 30% in the proportion of participants in the intervention group continuously abstinent at one month after randomisation compared with the control group, assuming 50% continuous abstinence in the control group and 10% loss to follow-up).

Overview of the SPGeTTI App

Building from the insights gathered during the formative phase, the functions and features of the intervention and control app were designed as illustrated in

Figure 2.

Figure 2. SPGeTTI App: Differences between the Intervention and Control Versions.

Smartphone-based problem gambling evaluation and technology testing initiative   SPGeTTI II

Just-In-Time

In addition to the visible features and functions within the intervention app, geolocation technology was developed to capture when a participant entered an electronic gambling venue and therefore enable a notification to be sent "Just-In-Time".   The purpose of these Just-In-Time notifications, linked to venue geolocations, was to provide support in that present moment, to the participant, as a means to delay, distract, and deter, thereby enabling them to decide not to continue with their probable gambling intent. The success of this strategy is reliant on the individual's perception that by not gambling, they will gain greater rewards such as, improved financial situation, less stress, family harmony etc. Evidence suggests that the longer away the reward is the less effective an immediate change in behaviour may be.   This delay concept is often called delay discounting. Delay discounting can be defined as the cognitive process that allows the individual to compare values between the immediate and delayed commodity.[30] Some research on substance use suggests that an *elevated delay discounting prior to drug use is a risk factor for addiction*.[31]   Others suggest that the size of the reward later is important, but all agree that delay discounting is complex. Therefore, we combined the idea of Just-In-Time as an ecological momentary assessment prompt [32] and blended it with the concept of delay discounting, to create the content of our notifications (Figure 3).
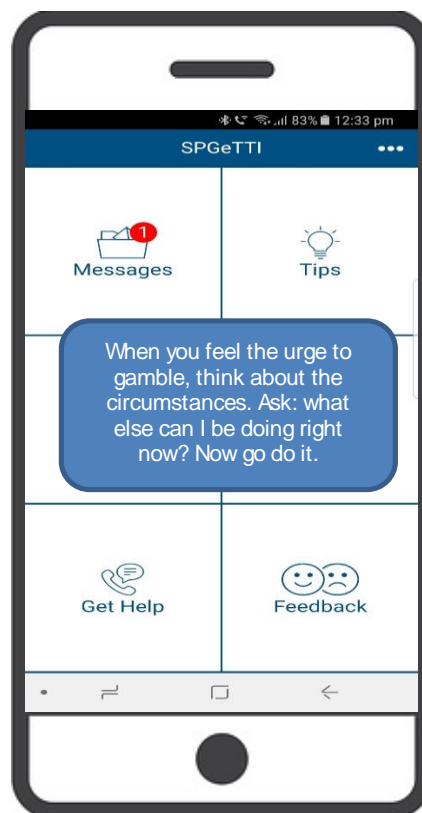
Figure 3. An example of a Just-In-Time Notification

Creating the Venue Coordinates for Just-In-Time function

Regularly updated data on New Zealand gambling machine location addresses are obtainable from the Department of Internal Affairs website (see: http://www.dia.govt.nz/); these addresses can be geo-coded. Geospatial software such as ArcGIS Network Analyst™ can then be used to help the processing of the spatial data and calculation of a distance between the person with a smartphone and a gambling machine. With this technology, we programmed all the Auckland gambling locations geolocation coordinates into the app. In some cases, due to the size and location of the venue, such as the Sky City Casino, which has many layers to its environment and also sits amongst multiple other shopping venues, we also increased the geolocation accuracy by creating accurate bounding boxes for the building to minimise false positive measures. Bounding boxes are areas defined by two or more longitude and latitude coordinates to create a rectangular border that fully encloses the area of interest i.e. the gaming zones, thus increasing the accuracy of an in-boundary event (Figure 4).

Figure 4. Example of a Geo-location Bounding Box (green box)

We also explored geo-fencing to help with accuracy and specificity when there were a collection of venues within a small radius. Similar to geo-bounding, geofencing attempts to create a virtual geographic boundary around an area using GPS technology.   When a mobile device enters or leaves the area the software is

enabled to trigger a response. Geofencing uses larger areas than geo-bounding and does not require specific coordinates.

Figure *5* shows the venues and the geo-fencing areas used to help with accuracy however, the risk of this approach was the potential to trigger more false negatives than geo-bounding. As such, where feasible we used geo-bounding to maximise sensitivity and minimise false negatives.

Figure 5

Figure 5. Gaming venues and mapping of geo-fencing areas

After testing and refining the geolocation technology, we mapped all 268 venues in Auckland, representing 3796 electronic gaming machines (as at Dec 2015) across greater Auckland. Table 2 presents the number of venues and number of electronic gaming machines by their Auckland Local Board boundaries.

Table 2. Number of electronic gaming machines in Auckland (as at Dec 2015)

Location	Number of Venues	Number of Machines
Albert - Eden	13	174
Devonport - Takapuna	7	117
Franklin	15	200
Henderson - Massey	16	251
Hibiscus and Bays	17	235
Howick	22	351
Kaipatiki	17	247
Mangere - Otahuhu	15	214
Manurewa	16	229
Maungakiekie - Tamaki	18	272
Orakei	6	71
Otara - Papatoetoe	19	274
Papakura	14	229
Puketapapa	3	33
Rodney	11	139
Upper Harbour	12	160
Waiheke	3	27
Waitakere Ranges	8	102
Waitemata	23	308
Whau	13	163

Notifications started at 5 minutes in the venue and repeated every 10 minutes for an hour. After an hour, a personalised notification which included the total time spent in the zone to date, was sent each hour until they left the venue.

Smartphone Operating Systems

Due to the complexity of the technology, and the need for Apache Cordova plugin for the geo-positioning technology it was not possible to use a hybrid platform to develop the app. There was insufficient funding to develop the app in the two main operating systems (OS) of Android and iPhone and we needed to select the best OS with which to develop SPGeTTI on.

We explored the possibility of assessing phone ownership, by examining data on gambling from the 2013/14 Health Survey using the Confidentialised Unit Record File (CURF) request to Statistics NZ, however, phone ownership or a record of a landline versus mobile phone call information is not collected. We obtained ethics approval to undertake fieldwork to explore smartphone ownership directly. We found that of the 60 participants across 15 venues with electronic gaming machines, only 3 people reported owning an iPhone. A brief internet search of phone ownership found that Android phone ownership had been reported to be out-growing iOS Apple phones globally.[33] As such, this combined with our fieldwork, it was decided to develop the app was developed for Android phones only.

Personalised App Intervention Content

A core component of the intervention was the regular cognitive behavioural change messages delivered throughout the trial period, using notifications within the app. The development of the notifications was underpinned by Marlatt's Cognitive Behavioural Model [34] for relapse prevention. The model suggests that both immediate determinants such as high-risk situations and outcome expectancies, and covert antecedents such as lifestyle factors and urges and cravings all contribute to gambling relapses. We built the content based on this model and the behavioural change techniques developed by Michie and colleagues.[35] Table 3 presents the framework used for shaping the final content to be delivered in the intervention app.

In addition to specific messages related to gambling relapse prevention, a range of wellbeing messages were also created to provide information concerning healthy eating, sleeping, physical activity, and alternate activities. Messages were personalised to the participant by using their name and tailoring was achieved by delivering specific messages depending on their G-SAS scores.

Table 3. Constructing the cognitive behavioural intervention notifications

Marlatt's Component	Example	Behaviour change techniques
Increase lifestyle balance	Develop positive addictions like exercise, meditation Substitute indulgences with recreation, massage Manage stress/anger Pursue previously satisfying activities	1.2 Problem solving 8.2 Behaviour substitution 8.4 Habit reversal 11.2 Reduce negative emotions 4.1 Instruction on how to perform a behaviour
Stimulus control techniques	Removing all items associated with gambling Avoid/leave high-risk situations	4.2 Information about antecedents 7.1 Prompts/cues 7.5 Remove aversive stimulus

Marlatt's Component	Example	Behaviour change techniques
		12.1 Restructuring the physical environment 12.2 Restructuring the social environment 12.3 Avoidance/reducing exposure to cues for the behaviour
Urge management	Coping imagery, such as urge surfing Positive self-talk	1.9 Commitment 15.2 Mental rehearsal of successful performance 15.4 Self-talk 4.1 Instruction on how to perform a behaviour
Education about warning signals of relapse	Lifestyle imbalances, positive expectations of gambling	11.2 Reduce negative emotions
Analysis of high-risk situations	Identify and plan for triggers/high-risk situations	1.2 Problem solving 1.4 Action planning 12.4 Distraction
Self-monitoring	Identify response to triggers by maintaining a record of situations, emotions, and interpersonal factors associated with gambling or urge to gamble	2.3 Self-monitoring of behaviour 5.4 Monitoring of emotional consequences
Mastery experience	Break down the overall task into subtasks, such as coping with an upcoming high-risk situation or making it through the day. Changing a habit requires building skills	4.1 Instruction on how to perform a behaviour 8.7 Graded tasks 15.3 Focus on past success 10.9 Self-reward
Vicarious learning	How others cope, become an objective observer of his/her own behaviour	6.2 Social comparison
Social persuasion	Encouragement and support from others to avoid gambling and build new skills	2.2 Feedback on behaviour 3.1 social support (unspecified) 15.1 Verbal persuasion about capability
Somatic and emotional states	Interpret physiological and psychological responses (positive mood builds self-efficacy) Anticipate and accept urges/cravings as normal responses to an external stimulus	11.2 Reduce negative emotions

Marlatt's Component	Example	Behaviour change techniques
Coping-skills training	Relaxation training, stress management, assertiveness training	4.1 Instruction on how to perform a behaviour 7.1 Prompts/cues 11.2 Reduce negative emotions 5.6 Information about emotional consequences
Outcome expectations	Education about the immediate and delayed effects of gambling Use of decision matrix (pros and cons of immediate and delayed effects)	5.3 Information about social and environmental consequences 5.6 Information about emotional consequences 5.5 Anticipated regret 6.3 Information about others' approval 9.2 Pros and cons 9.3 Comparative imagining of future outcomes
Lapse management	Contracts to limit the extent of use/contact support person after lapse/evaluate the situation for triggers, reminder cards about how to cope	1.8 Behaviour contract
Cognitive restructuring	Consider lapse a mistake, not a personal failure. Reframe perceptions – lapses signal the need for increased planning. A lapse will not lead to a relapse	4.3 Reattribution 13.2 Framing/reframing

Languages

The app (Intervention and control) and notifications were also translated into Mandarin and Cantonese.

Raising Awareness and Promoting the App

Posters were prepared and placed in all the gambling service provider offices (

21

Figure 6 and

Figure 7).

Figure 6. Posters in service provider locations: English Version

Figure 7. Posters in service provider locations: Chinese Version

Business cards (Figure 8) were given to all service provide gambling counsellors to hand out to potential participants and a supply was given for the services to put into their waiting rooms or other sites they deemed appropriate. Participants could be given these and take them away to explore what the study was about if they wanted to share the study with a significant other if they wanted time to consider participating.

Front　　　　　　　　　　　　　　　　　　　　*Back*

Figure 8. Promotional Business Cards

Service Provider Newsletters were also used to raise awareness. An example of one newsletter content is shown in Figure 9.
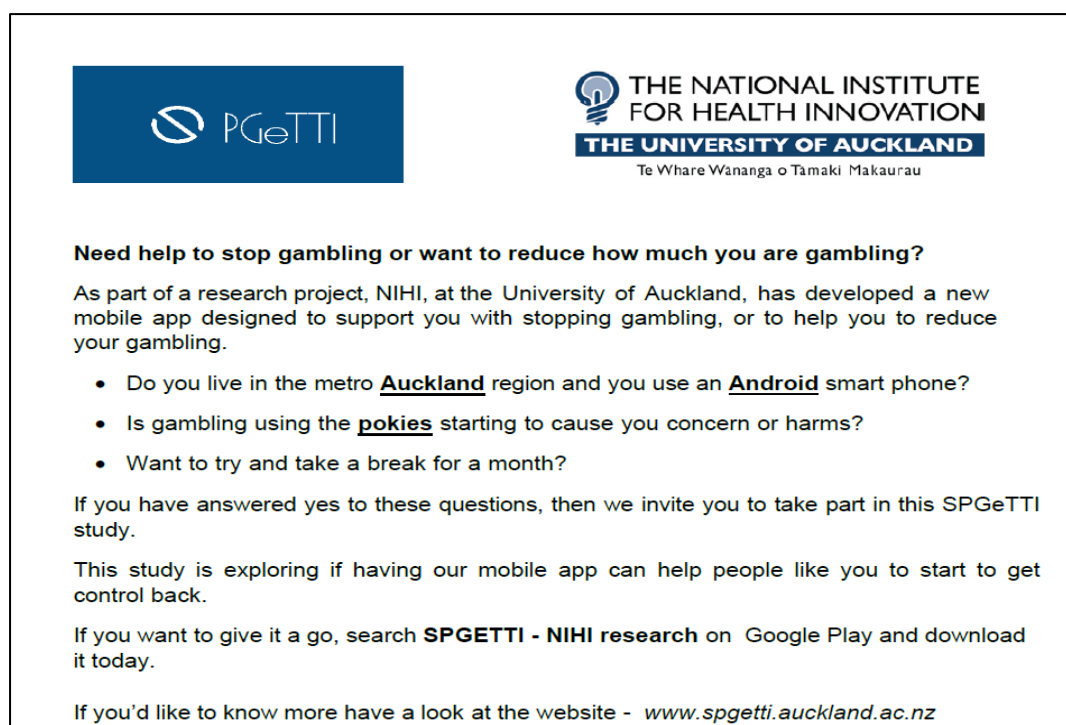
Figure 9

Figure 9. Network Promotion / Newsletter Example to Support Recruitment

Other modes of communication and promotion included Facebook, where a SPGeTTI Facebook page was established and used to share new information with followers and provide links to service provider webpages and other Facebook sites and to launch Facebook promotion and Google Ads.

Service Provider Training

Three information and training sessions about the study and the app were undertaken with each provider. The aim of these sessions was to familiarise the counsellors with the study and the app. A "Key Points Card" (Figure 10) was created to be an *aide memoir* for the counsellors to use to discuss the study with a potential participant.

Figure 10. Key Points Card

Study Advisory Group

A study advisory group was established who guided and informed the research team. The advisory group included clinical practitioners from gambling support services in Auckland, including their leads for Maori, Pacific and Asian services. Research academics experienced in addiction research were also part of the advisory group.

Ethics

Ethics approval was obtained from the NZ Health and Disability Ethics Committee, reference 16/NTA/86. The study was also registered with Australian New Zealand Clinical Trials Registry (ANZCTR), reference 12616000453482.

3.3 Clinical Trial Study Results and Adaptations

The app was released in November 2016 and the goal was to recruit and randomize 108 participants by June 2017.

By February, the study had been open for four months and we had received only 4 referrals. In consultation with providers and the Advisory Group, the eligibility criteria of a PGSI score of 7+ was changed to 5+ as an attempt to broaden the potential participant pool. Other actions taken to lift recruitment and mitigate barriers, included increasing the Facebook posts, app page tagging, promotion on other websites (including HPA), working with Home Care Medical and continuing to visit with provider staff at the various services. Additionally, a researcher was made available to meet potential participants at provider offices when necessary.

Despite the reduction in the PGSI criteria and the frequent promotions and meetings with service providers, only 17 potential participants had been referred by the end of recruitment time (June 2017). Of these, 6 were eligible and 4 consented to participate. Three were randomized to the Intervention app and one to the Control app (Figure 11).
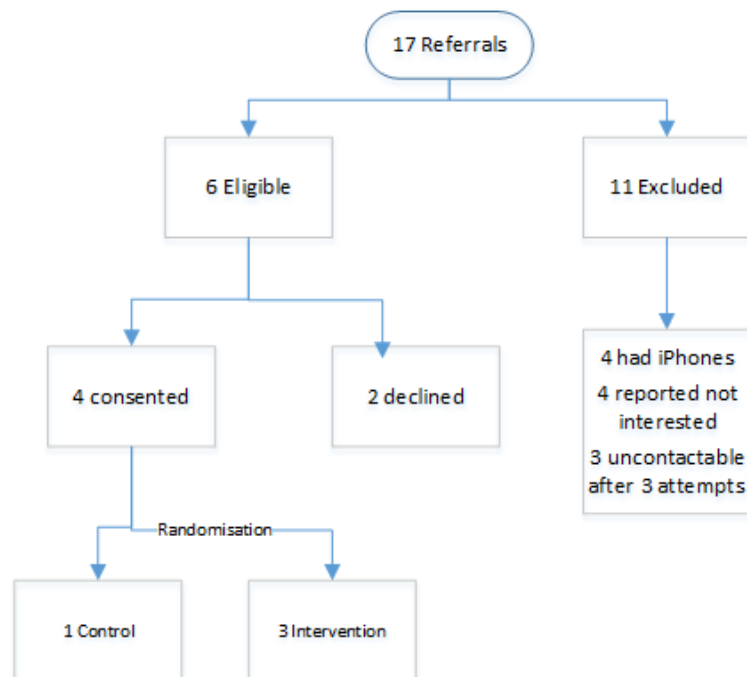
Figure 11. Flow Diagram of Study

Participants were 2 male and 1 female and one preferred not to answer. All were European and aged between 30-39 years (n=2) and 40-50 years (n=2). Three people retained the app for the full one month the other person uninstalled it after 1 week (control app user).

The main feedback provided by three participants (1 lost to follow up), was:

- Battery drainage was sometimes an issue
- The sounds for the notifications were too soft and not long enough
- I didn't hear the in zone messages until way later
- Didn't need it anymore
- Too many messages
- I liked some of the messages but not all were relevant
- I thought it would do more

Of the three who completed the 1 month period, only one person had any in-gambling-zone episodes indicating that they had entered and stayed in a gambling venue. On both occasions, less than one hour was spent inside a venue. It was evident in the app transaction data that they viewed two of the four just-in-time notifications that were sent. The remaining two participants did not have any in-gambling zone events recorded in the data. However, all three had the location services turned off on their phone at different times during their participation time periods.

The three participants who completed the study month also completed the end of the study questionnaire. The other participant who was lost at 1 week was not able to be contacted.

Table *4* presents participant responses to how important the app was in supporting wellbeing, urge control, reducing gambling and supporting relapse prevention during the study month.

Table 4. Participant Ratings of the Importance of the App across Five Domains

Questions	Not important	Somewhat important	Important
Wellbeing	1	1	1
Urge control	1	1	1
Reducing gambling frequency	1	1	1
Reducing time spent gambling	1	1	
Supporting relapse prevention	1	1	1

With respect to the ease of use, and look and feel of the app, participants all reported that it was "Good". Two participants reported that the features feature they liked best were the daily messages and one participant liked the Call for Help feature. No participant reported that they would use the app if it was available outside of the research.

Given the paucity of numbers, it is not possible to draw any conclusions on the effect of the SPGeTTI app on supporting relapse prevention or minimizing or preventing gambling-related harms. There was clear support by the Advisory Group and the Gambling Service Providers that a mobile app was still worth exploring but that a review and redesign was needed. The following Clinical Study Review and Critique and Study Adaptation section describes the study reflection and critique process undertaken and the lessons that emerged, and how these learnings helped to reshape a new study design. Section 4 presents the new study design, methodology and findings.

3.4 Clinical Study Review and Critique

To understand why the study was unsuccessful we held discussions with the Steering Group, other addiction research academics and with professionals from the different service providers. The outcome of these discussions is described below.   A modification was made to the ethics application to also interview end users using individual interviews or focus groups.

Recruitment

The SPGeTTI app was not designed to be a stand-alone full cognitive behavioural change program. It was designed to be an adjuvant to counselling provided by the service providers. As such, recruitment was tied to participant referrals from providers. Despite working with each provider (and at times individual counsellors), and mapping out the best participant identification and referral to the researcher, (see Figure

1: p 9) referrals remained sparse. The key issues that were identified as likely to have impacted on the study recruitment were (i) English language literacy, (ii) mobile phone ownership, (iii) the eligibility criteria, (iv) the method of recruitment, (v) the role of the control group, and (vi) the initial data gathering. The issue details are briefly summarized below;

i.   The issue of English language **literacy.** Despite trying to partially mitigate the issue by each service provider agreeing to have the client's counsellor (or another appropriate professional) available at the time of recruitment to support the understanding of the study, this option did not eventuate as a viable solution. Steering group member feedback suggested that while they agreed the idea was good, it was difficult to arrange, and implement and that timing between a possible participant and availability of a counsellor was an issue.

To partially mitigate English as a second language the project had the opportunity to work with a PhD student to **translate** the information and consent forms, advertising and promotion, and the app content into Mandarin and Cantonese. The student was also available to provide support to participants when needed. These were positively noted by providers and from end-user focus groups. However, these elements did not elicit any participant who chose the Chinese version of SPGeTTI.

ii.   Mobile **phone ownership** was mentioned. Prior to determining our approach, we undertook an initial scoping of smartphone ownership. We did not identify that phone ownership was a substantive barrier. However, we asked providers to keep track of possible participants who could not participate due to "not owning a phone". No feedback on this was received. Of note, our scoping study identified that iPhones were not commonly owned, and yet four participants were excluded because they owned an iPhone.

iii. For those who owned a mobile smartphone, the **version of phone operating system** were considered as being a potential barrier to uptake. Some of the phones at the cheaper end of the market have limited capacity to upgrade and while they can do all the main functions of a phone, there can be issues with downloading apps. Therefore, while we couldn't provide phones we made the application useable on a minimum of a 4.2 OS. Current new phones were being sold with an OS of 5.0. The other issue with the cheaper-end phones is related to storage. Storage is needed to enable apps to be downloaded and functions to operate. Similar to the OS, storage capability on a phone may be almost totally used by the main functions within the phone. Many apps use around 10 megabytes (MB) and so we designed our app to use a maximum of 1 MB. Furthermore, the app was designed to work off-line and only connect to the internet when it connected to Wi-Fi. All agreed that there was nothing more that could be done.

iv.   The **eligibility criteria** for recruitment referral and participation was thought to be the PGSI score which was set at 7+. Despite being reduced to 5+ and yet no increase in referrals occurred. The requirement that recruitment was limited to participants that were **current service clients** was identified as limiting potential participant numbers. Arguably, those within treatment services have already recognised they have a problem and therefore such opening the app up to people who may not be currently receiving treatment was a suggestion.

Excluding people who were either banned or had initiated a **multi-venue exclusion** agreement, was suggested as a barrier to eligibility. However, as the study and app were not designed to include this group the utility of the app in its current form was suboptimal for this group's motivation. Similarly for those who were on remand from prison.

To mitigate the difficulty with recruitment via providers, it was suggested that a change in the recruitment requirement was necessary. Changes suggested were to enable people NOT in treatment to access and use the app.

v. The study had designed the **consenting and recruitment process** to be undertaken in person. However, finding a time to suit the potential participant was difficult and was a possible recruitment barrier. A solution was to conduct all the recruitment over the phone so no face-to-face meetings were needed.   Undertaking all recruitment through the app was suggested as a possible way to minimise these barriers. A new training plan was written, including how to "walk" a participant through the process of downloading an app and problem-solving issues if they emerged. This approach was agreed and ethics approval for the change was given in 2018.

vi. The nature of the research being a **clinical trial** with an intervention and **control group** was thought to be a barrier in that clients who were willing to participate were wanting something to help them and so the potential of getting the control app was a barrier. In addition, the intentionally low fidelity of the control app was identified as a potential a barrier. However, given the lack of participant users (only one person randomized to the control) it is not possible to make a judgement.   Furthermore, while participants were not told which group they were randomized to, everyone was informed that if they happened to be in the control group they would get the intervention app after the 1 month study period.

vii. To generate the randomization process in order to allocate the participant to the control app or intervention app, the participant was required to **enter a set of baseline data.** This included demographic information, complete a few questions on current gambling behaviour, set a goal and complete the baseline Gambling Symptoms Assessment Scale (G-SAS).[29]

Figure 12 graphically presents the baseline information required and while the app design guided the participant through these questions for a user-friendly experience, comments from providers suggested that the length would likely be "off-putting" to participants. Given the lack of those recruited, it is not possible to determine if this was an issue. However, a Pew Research study into the correlation of app downloads and the app permissions requested (potentially analogous to the collection of our baseline data) found that "60% of these app downloaders had chosen *not to* install an app when they discovered how much personal information was required in order to use it, while 43% had uninstalled an app after downloading it for the same reason".[36]   In another study, authors[37] reported that there was a small but positive correlation with the number of permissions and downloads for apps defined as popular. They suggest that the permissions for these popular apps have a direct relationship with functionality. As our app was unlikely to be associated with a popular app we concluded that the level of baseline data at the outset may have been off-putting when the recruitment process was not facilitated by the face to face contact.
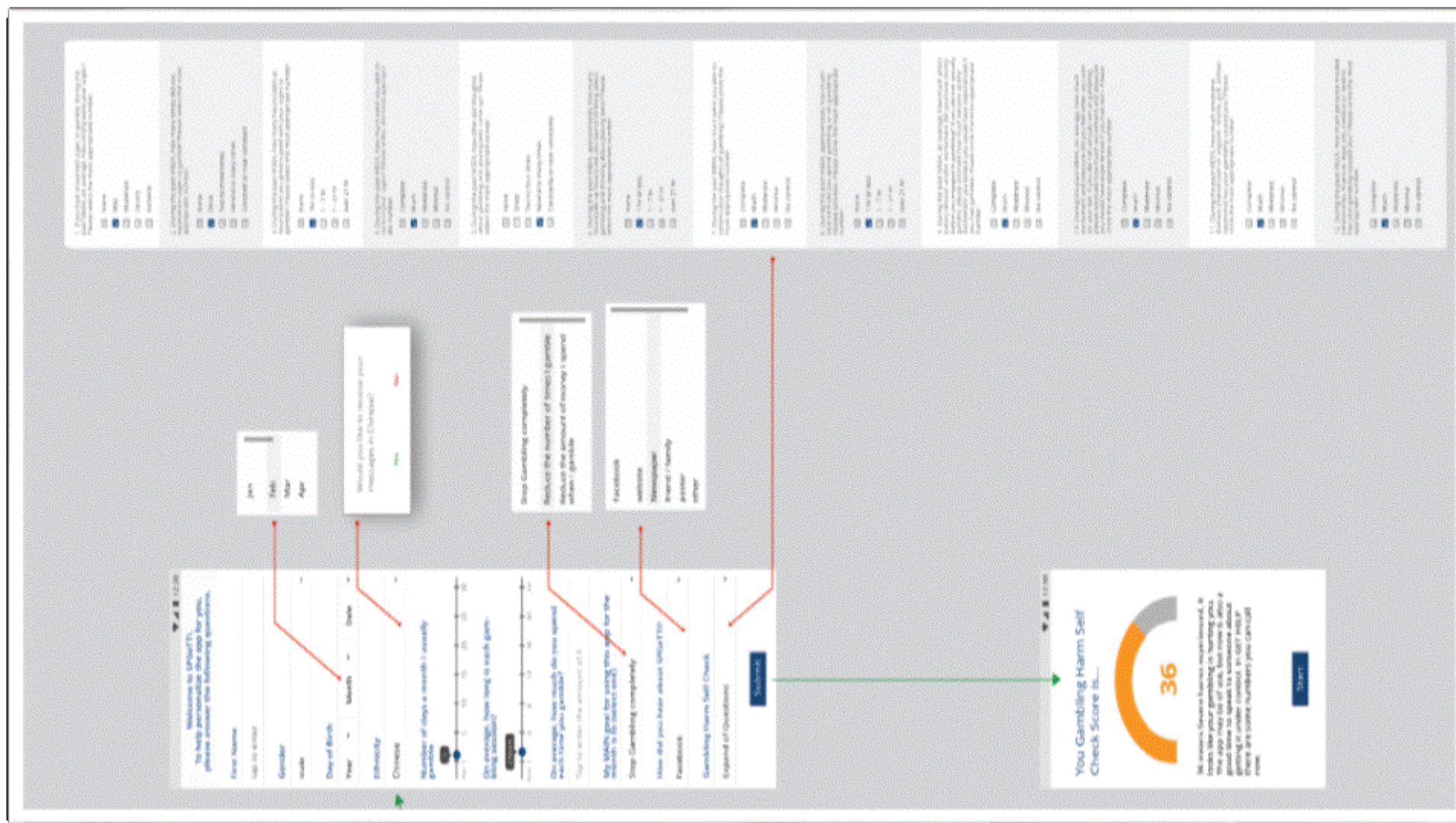
Figure 12. Baseline Data Collection within the app

Technology

A review of the app, its functionality and underpinning technology was also undertaken. Two main areas for improvement were identified:

I. Feedback from the first few participants indicated that that app was draining their **phone battery.** Significant work was undertaken to rationalize the use of the geolocation capability to mitigate the participants' experience of undesirable battery depletion. A range of sleep, uptime and accelerometer functionalities native on most smart phones with operating systems 4.2 and above were used to manage the need to use accurate geolocation systems and minimize the battery drainage. These changes were deployed early in 2018.

II. The **sound** used to signal a notification, particularly if they were entering or in a gambling venue, was too quiet according to participants. The nature and volume of the sound was changed and tested so it could be heard in competing noisy environments, such as clubs and pubs.

3.4.1 Review Summary

The lack of participants meant we were unable to test the hypothesis that SPGeTTI could be an effective adjuvant tool for supporting relapse prevention. Nonetheless, there was still significant interest and support by the Steering Group and providers signalling that SPGeTTI was a valuable tool but that the RCT was too ambitious. It was decided that a prospective cohort and evaluation study would be an appropriate approach to both test the effectiveness of the app and address the issues experienced to date.

The next section reports on the new study design and findings.

4   Study Redesign

4.1   Aim

The aim of the redesigned approach was to evaluate the effectiveness of the SPGETTI app as a tool to support a reduction in harmful gambling (specifically, using electronic gaming machines, EGMs) and where possible to support relapse prevention.

4.2   Methods

A prospective cohort study and outcome evaluation methodology was determined as the most appropriate approach to explore the impact of the app.

Interviews and focus groups with app users were undertaken virtually and face-to-face as a way to provide a more in-depth understanding on the enablers and barriers to using the app, the acceptability of the app, its perceived usefulness, and any other features that may be important to understand uptake, retention and effectiveness.

Our experience and that of other researchers in the gambling research environment is that gathering feedback from this population using standard focus group and interview methods can be difficult. Nevertheless, it was important to find ways to collect this information to understand the place of apps for this population. There is also an equity issue: they should have the opportunity to provide feedback. Therefore, we used four additional modes for gathering feedback were created. These were:

- An online survey, promoted through the app (at end of study period), and via URL links on the SPGeTTI webpage, Facebook posts and Google Ad posts
- A "contact us" page within the website that enabled anonymous feedback to be provided
- An 0800 line (0800 3676444 (0800 FORNIHI) where people can anonymously, voice record their feedback.
- Within the app, participants could voice record feedback.

Study population

The study population were adults aged 18 years and over who self-identified that they have a gambling problem primarily involving EGM were concerned about relapsing and wanted support to stop or reduce their gambling, who possessed and used an Android smartphone capable of accurate location detection and were able to give informed consent to taking part in the study.

Potential participants could proceed if they agreed to the study consent and met the study eligibility criteria, as displayed within the app (

Figure 13).
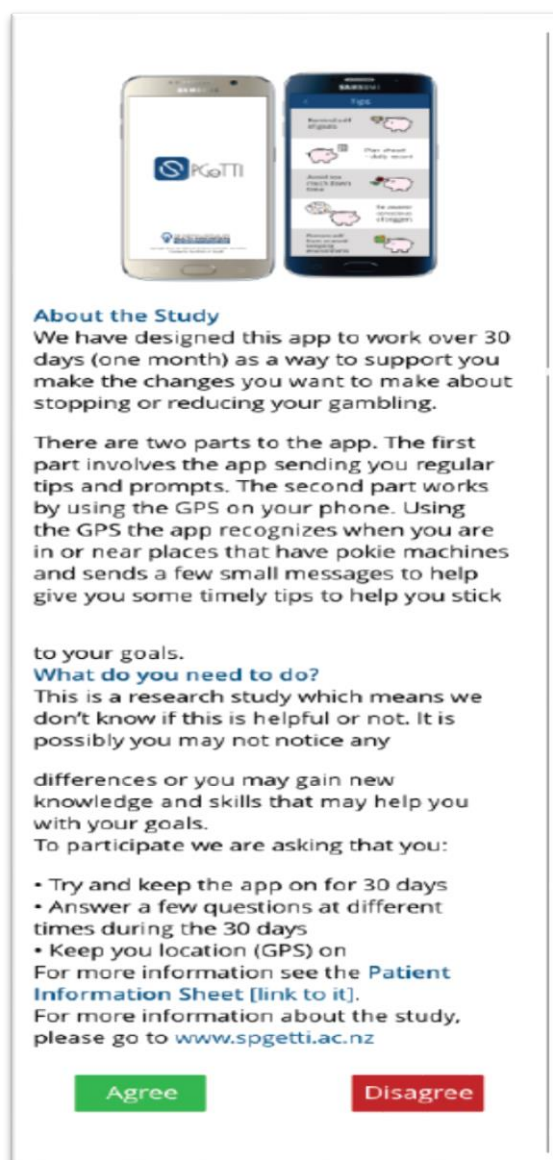
Figure 13. Within app research participation consent screen

4.3 Recruitment

Participants were recruited over nine months from January – September 2018 using online advertising boosted campaigns (Figure 14. Stuff Ad campaign), and advertisements on the Choice not Chance web

site (Figure 15Error! Reference source not found.), the Gambling Help Line website and Facebook page (
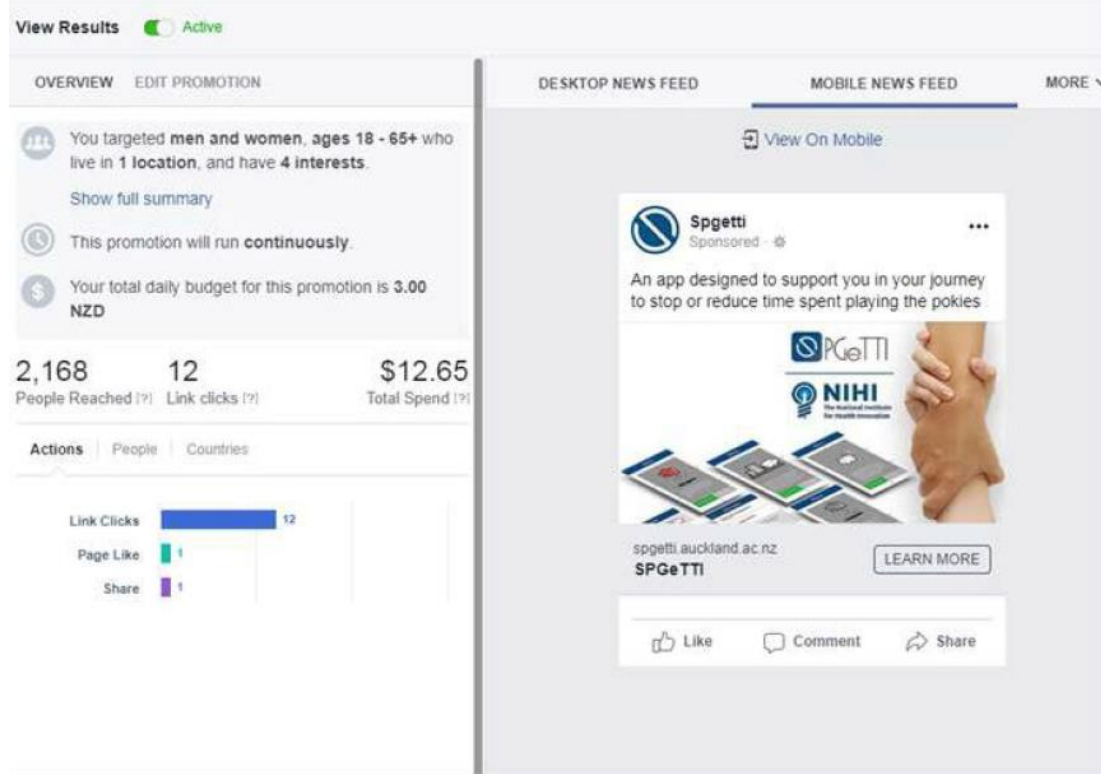
Figure 16), other websites (see https://www.stuff.co.nz/auckland/local-news/central-leader/102424304/phone-app-developed-to-curb-compulsive-gambling-behaviours), Neighbourly. Twitter (Figure 17) and newsprint stories (Figure 18) and through web media stories about the study (http://www.indiannewslink.co.nz/sept-1-2018-digital-edition/). Posters displayed in waiting rooms and facilities operated by the problem gambling treatment sector were also used to promote the study. All boosted ads and all posters were restricted to the Auckland region.
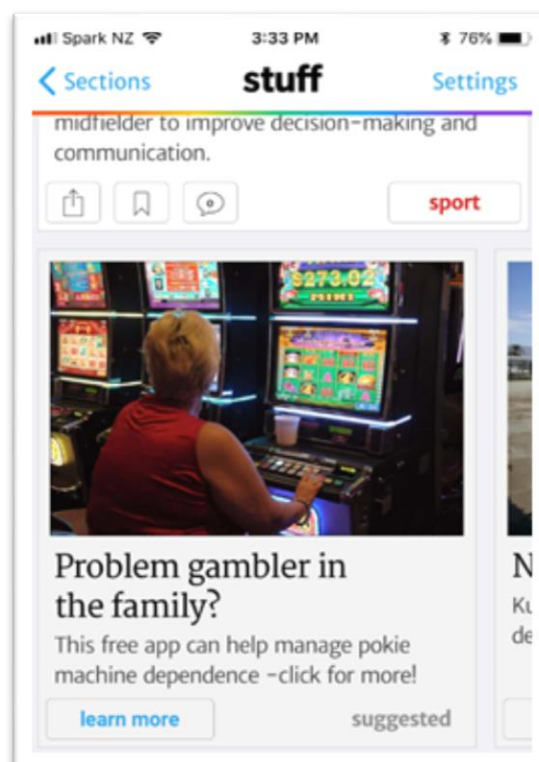
Figure 14. Stuff Ad campaign
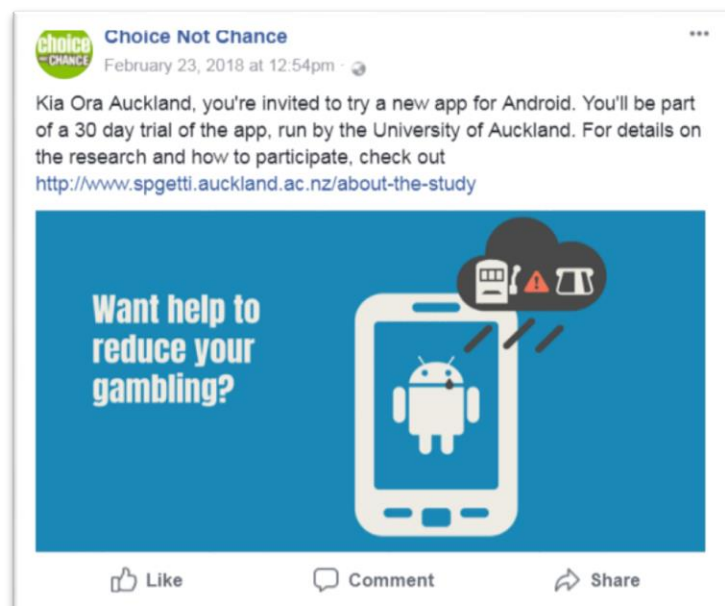
Figure 15: Advertisement on Choice not Chance Pages
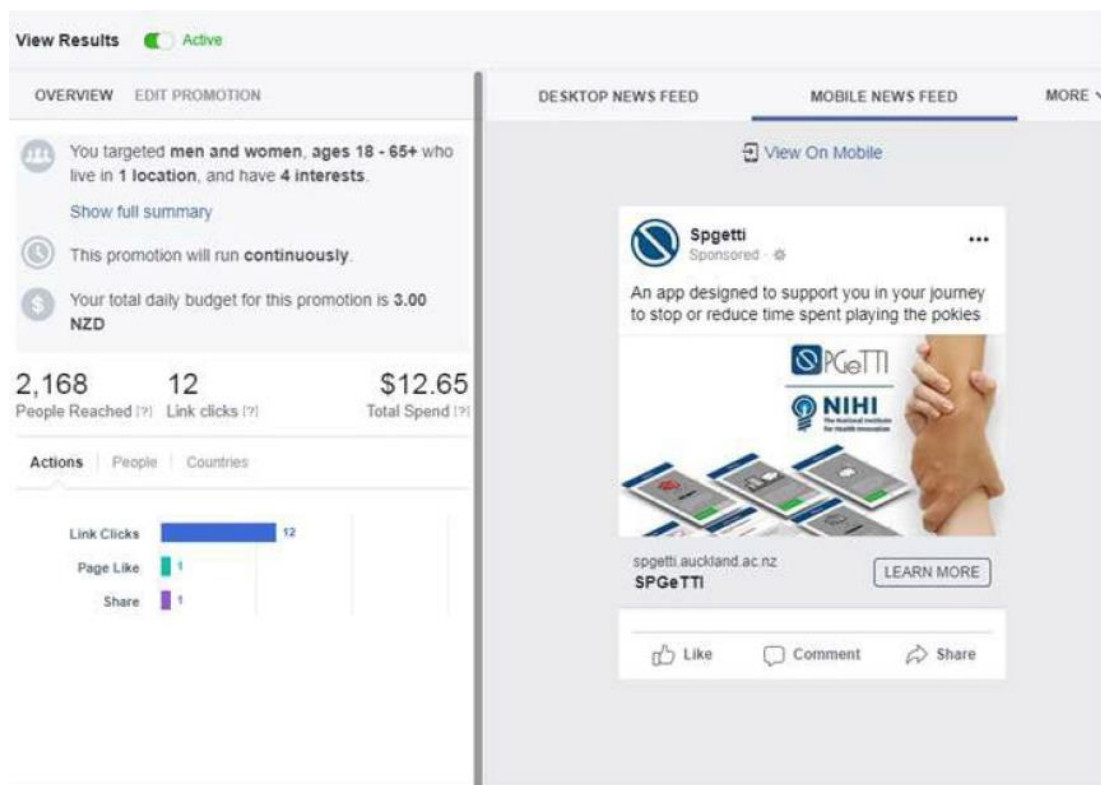
Figure 16. Face Book Boosted Advertisements
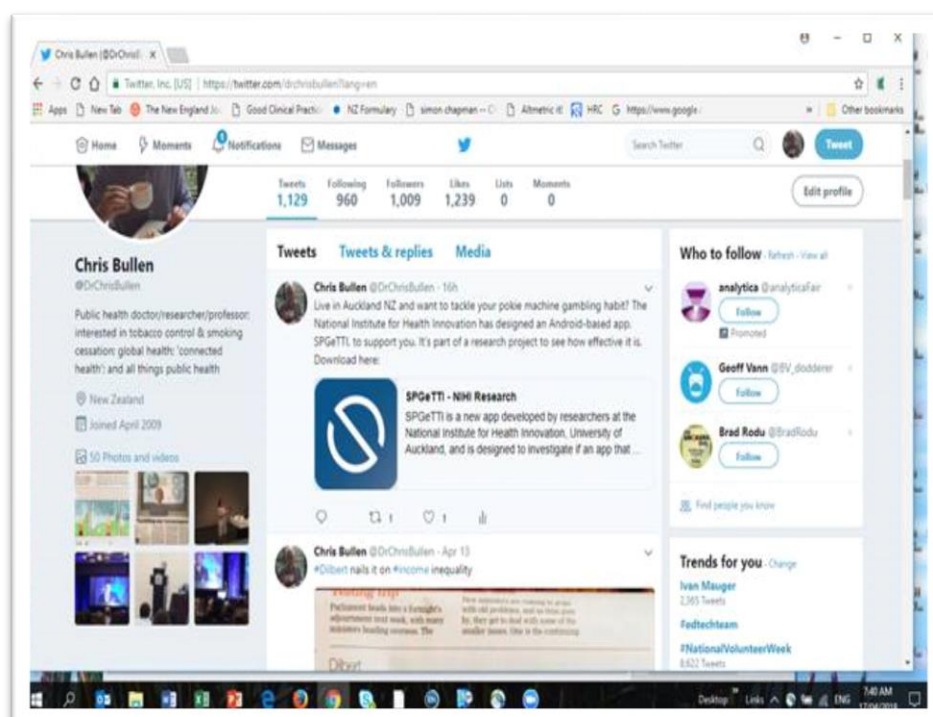
Figure 17. Example of a posted tweet

Figure 18. Newsprint story in Central Leader

4.3.1 Sample size

There was no pre-specified sample size but we aimed to recruit, and follow-up for one month, a minimum of 100 participants.

4.4 Outcome measures

The primary outcome was continuous gambling abstinence at one month from app download if "Stop Gambling" was selected as a goal, or a reduction in gambling if "reducing time spent gambling" was the goal selected.

We measured the number of participants who were continuously abstinent using 'no lapses', where a lapse is defined as spending 10 minutes or longer within a venue with EGMs determined by pre-loaded EGM venue location co-ordinates).

We measured a reduction in frequency of gambling using the same geolocation technology as was used to determine abstinence by measuring change from the selected current frequency recorded at baseline with that at follow up.

Other data were collected on the acceptability of the app, its perceived usefulness, barriers and enablers, and other features important to understanding uptake, retention and effectiveness.

4.5 Data analysis

The cohort data were analysed using simple statistical methods. All qualitative data were analysed using a general inductive approach, in which key themes were identified by reading, re-reading and constant comparison of the collected data until data saturation occurred.

4.6 App Redesign

The app design changes were to;

- Discontinue the control app,

- Improve the location sensitivity,

- Reduce the data collection burden on participants at the initial recruitment and engagement.

To do the latter, the full G-SAS questionnaire was limited to G-SAS questions 2 and 8 only. These two questions were chosen because they provided some insight into the participant's urge to gamble (G-SAS Q2 urges) and the time a participant reported spending on gambling (G-SAS Q8 behavior). This was presented in the app as illustrated in

Figure 19 below.

Participants could complete the full G-SAS at this point if they wished to do so but it was not compulsory. Nevertheless, as this was a critical piece of information to measure change from baseline to follow up, all participants were sent a notification through the app to complete the Self Check (G-SAS) within the first week and then again on completion of the study at 4 weeks. Participants could complete the G-SAS at any time in between if they wanted to assess and monitor their own changes.

Figure 19. New baseline data collection screen at download.

Ethics

An amended Ethics approval was obtained from the NZ Health and Disability Ethics Committee, reference 16/NTA/86.

Registration

The study registration was amended on the Australian New Zealand Clinical Trials Registry (ANZCTR), reference 12616000453482.

4.7 Results

Promotion

Between January and September 2018 the SPGeTTI study and app was promoted over a wide variety and modes of media (Figure 20). The peaks of interest (determined by downloads) appear to be related to when a story (Seek, Central Leader print, Indian News Week) was published either on-line or in print. The largest peak of downloads (n=23) occurred soon after a story was published on line with the Indian News Week (study week 23).
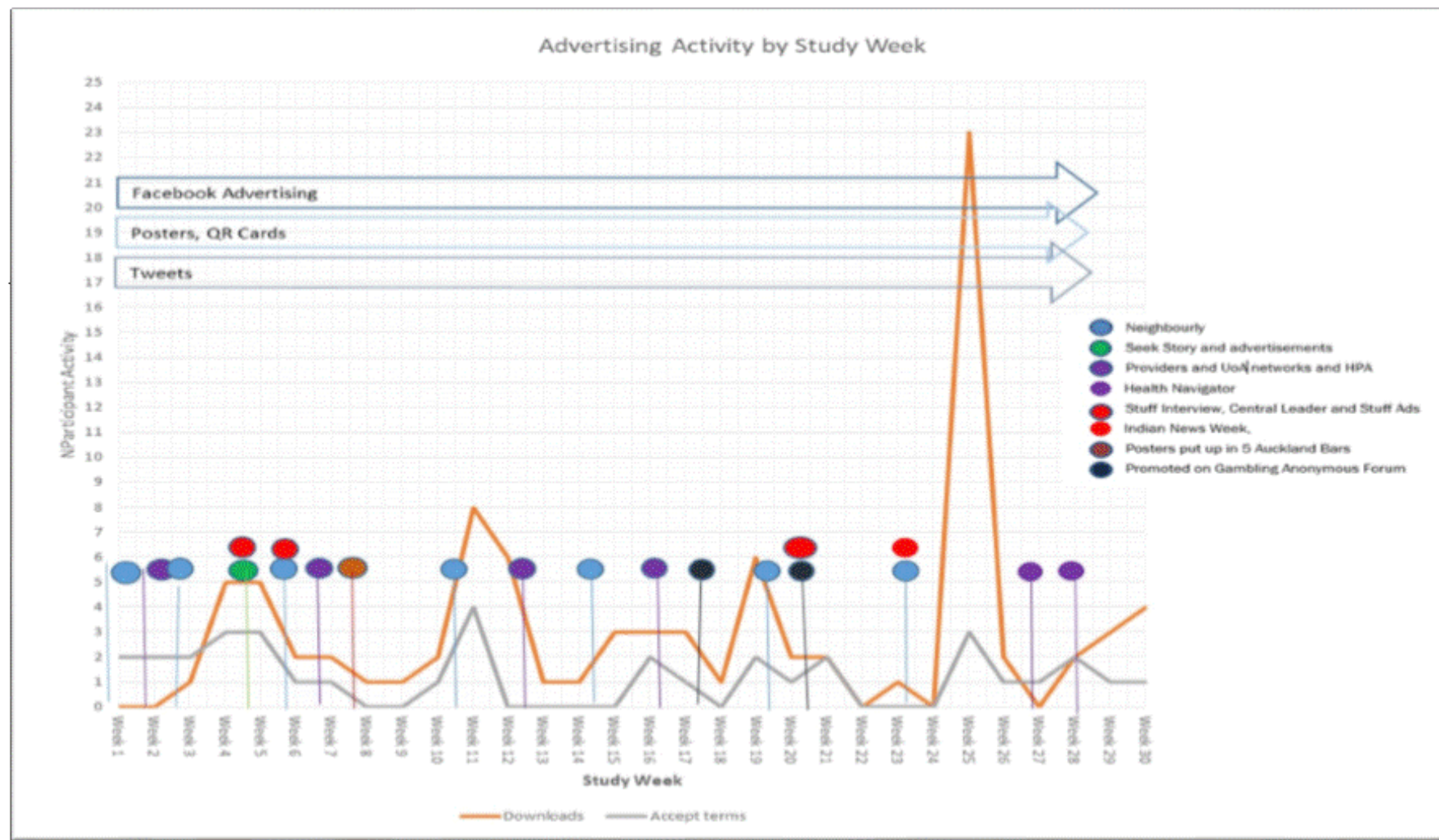
Figure 20. SPGeTTI Study App Advertising and Downloads

However, conversions to consenting were low from these sources (n=3). Of the 11 respondents who completed where they heard about the study most were via Facebook (n= 7), with the remaining responses as newspaper (n= 2) and other (n=2).   While the numbers are small, and the signal that Facebook was the commonly reported modality, the high app hit rate after stories (rather than advertising) appeared in the media suggests that human interest stories are also a key avenue for study promotion.

Downloads, Study Consent and Completion

Between January and September 2018 there were 268 views of SPGeTTI on the app store resulting in 100 people downloading the app. Of these, only 39 people agreed and consented to be in the study and only 23 completed the baseline data. Only four participants completed the final questionnaire on completion of the study, a 4% completion conversion rate (Table 5). Figure 21 illustrates the participant download, accept and baseline data completed by research week.

Table 5. App downloads and Consents

Downloads	Consented	Baseline Data	Follow-up data
100%	39%	23%	4%
100	39	23	4
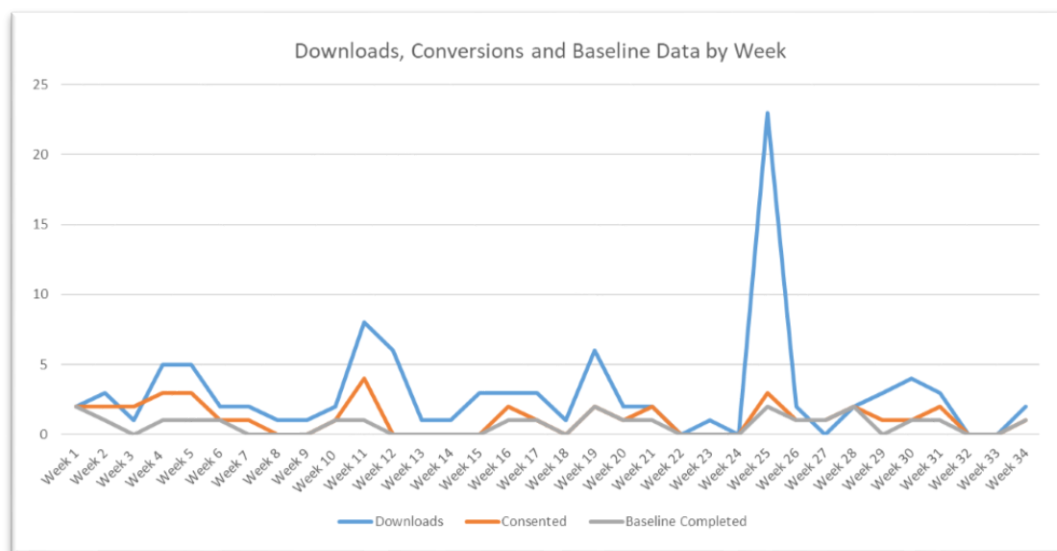
Figure 21. Downloads, Consents and Baseline completes by Week

The 23 participants who completed the baseline data were mostly male (n= 14, 61%,). Around half (n=12, 52%,) recorded their ethnicity as New Zealand European, and two thirds (n=15, 65%) were aged between 30-49 years (Table 6).

Table 6. Participant Demographics

		Age				
		<30	30-39	40-49	50-59	60+
Sex	Female	1	3	3	2	
	Male	1	6	3	2	2
Ethnicity	Maori			2	2	
	Samoan	1	1			
	New Zealand European		5	4	2	1
	Indian	1	1			1
	Chinese		1			
	Other		1			

Males and females were equally distributed across all age bands age groups except for the 30-39 year age group, where there were twice as many males than females (males 6 v 3 females).

The majority of participants who consented to participate were lost to follow up after the first study week (n=14/23), five were lost in week two (n=2) and three (n=3), leaving four to complete the month study.
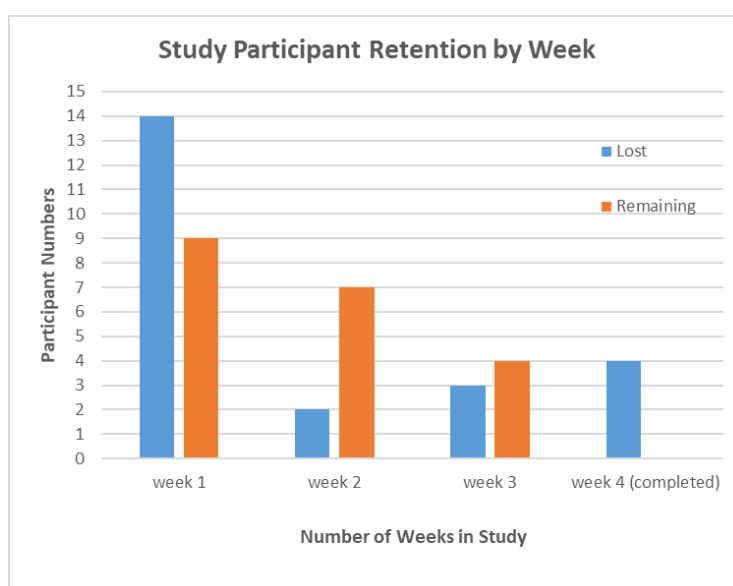
Figure 22. Study participant retention by week

Setting a Goal

Stopping Gambling was the main goal set by participants (n=17), with reducing the frequency of gambling activity and reducing money spent when gambling the same at 3 each.

Gambling Symptom Assessment Scale

The baseline G-SAS was completed by all 23 participants. Scores ranged from 0 (no harms) through to 48 (extreme) (Figure 23). The majority of participants (47%, n=11) scored within the Moderate Harms experienced category (21-30, mean 20; SD 13.1; SE 2.4) as illustrated in Figure 23 (see Table 1; p. 10 for G-SAS category definitions).
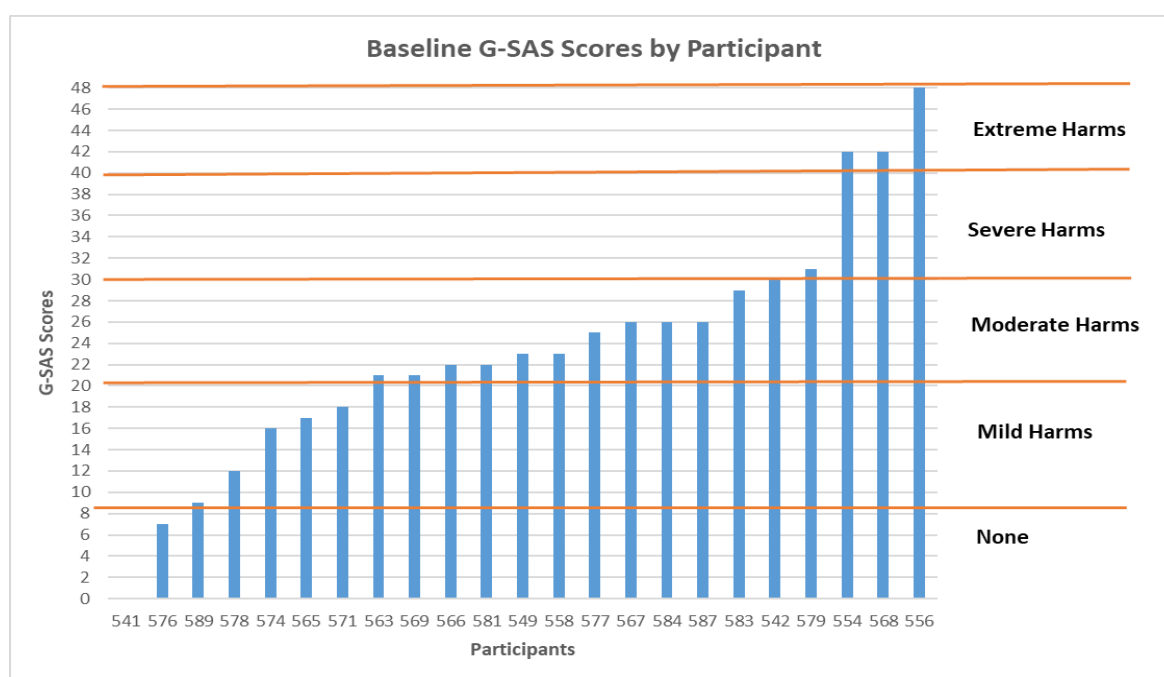
Figure 23. Baseline G-SAS Scores

Comparison of G-SAS from Baseline to Follow up

Four participants completed the G-SAS at one month. One participant reported 0 at baseline and 0 at one month. Two participants who scored 48 and 25 at baseline both completed the follow-up G-SAS with a score of 0. The fourth participant reported a score of 31 (Severe Harms) at baseline and a score of 24 (moderate harms) at follow up, a 7 point G-SAS score reduction over the month, suggesting that for this participant the app may have had a positive impact.

In an Electronic Gaming Zone

Of the 23 consented participants, nine had "in-zone" GPS signals recorded. Six of the nine were male. Five had one "in zone" event recorded. The time spent in zone ranged from 30 minutes to 4 hours. One

participant had two visits captured. One event had no exit time which may signal that the app, phone or GPS were switched off or signal was lost. For another event the participant spent two hours in the venue. Two participants had three "in-zone" events recorded with time in a zone ranging from 20 minutes to 120 minutes. The final participant had four "in zone" events with times "in-zone" all recorded as less than 60 minutes.

The time spent "in zone" and baseline G-SAS scores are presented in Table 7, which shows that the majority of the participants were either in the None or Mild Harms G-SAS category (n= 7).

Table 7. Number of Times in-zone and Baseline G-SAS

	G-SAS Scores				
	< 8	8-20	21-30	31-40	40-48
In zone x 1		4			1
in zone x 2	1				
In zone x 3	1	1			
In zone x 4					1

Just-in-Time Notifications

Each "in zone" event longer than 5 minutes generated a within app notification. After the first notification the notifications continued every 10 minutes until 35 minutes (i.e. 4 messages) then a notification came every hour until the participant left the zone.

Six participants did not view the "just-in-time" notifications at the time of their "in-zone" events. This could be because they had turned their notifications off or the sound was off on their phone.   These six participants had 1-4 "in-zone" events.

Of the remaining three participants, one viewed three of the "just-in-time" notifications and left the zone after 30 minutes. They had had only one "in-zone" event captured. Another participant with two "in-zone" events, received 5 notifications and viewed the first three at the time they appeared and did not read the remaining two for their first "in-zone" event, and remained "in-zone" for a further 30 minutes (total time "in-zone" 65 minutes). For their second "in-zone" event, the signal was lost and so it is not possible to ascertain how long they remained "in-zone" or if they viewed any notifications. Another participant with 3 "in-zone" events, only viewed the first "just-in-time" message for each "in-zone" event. However, for this participant, the time spent in a gambling zone decreased from 120 minutes (in-zone 1) to 20 minutes (in zone 3).

With regard to gambling severity score (G-SAS) both participants had G-SAS scores in the 8-20 category at baseline.

Cognitive Behavioural Support through Notifications

Through-out the study, participants received two notifications a day. These were developed using Marlatt's Relapse Prevention Cognitive Behaviour Theory (Table 3: p. 17), and the findings from the formative phase of the study. They were framed to help the participant to,

- Determine internal and external triggers of gambling
- Provide insights and methods for coping with internal gambling triggers such as loneliness, depression, or anxiety
- Develop and practice methods for coping with external triggers
- Develop and practice methods for coping with gambling cues and cravings

Of the four people who completed the study, 36 (60%) of the notifications were viewed at the time they were sent, 7 (11%) were not viewed at all and the remaining 17 notifications (29%) were viewed via the Messages Menu later that the same day or up to 6 days later.

While only 4 participants received all 60 messages, 11 participants provided feedback on the Notifications. Around half participants remarking positively about the notifications although the mean score suggested a neutral outcome (mean 3.4: SD 1.4). The positive responses from some participants suggest that the regular notifications were well regarded and may have provided some support. Taking into account that the majority of participants with a G-SAS assessment completed scored in the mild harms category (8-20) or none (<8) could indicate that these notifications provided information, support, and motivation were enough to meet their current support needs.

Within App Use

The main activity undertaken by users when they activated the app was viewing the Notifications (Messages) Screen from the main menu. This function held all the general wellness and cognitive behavioral change support notifications that were sent. All new or unread messages were easily with a red dot and number signaling how many unviewed messages as illustrated in (

Figure 24).
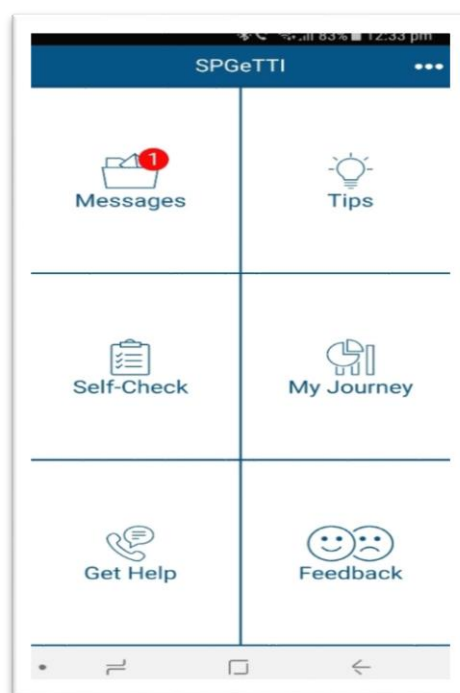
Figure 24. Menu Screen Highlighting an Unread Message (Notification)

The Messages screen was accessed 250 times. This was four times more than the next frequently accessed screen function - the Self Check (G-SAS) - with (Messages 250 views v 62 views Self Check. This was followed by a cluster of 7 other function screens with views from 43 (My Journey) to 24 (Get Help) while the study information function screens such as About Screen and Information sheet were viewed minimally (range 13- 7) (Figure 25).
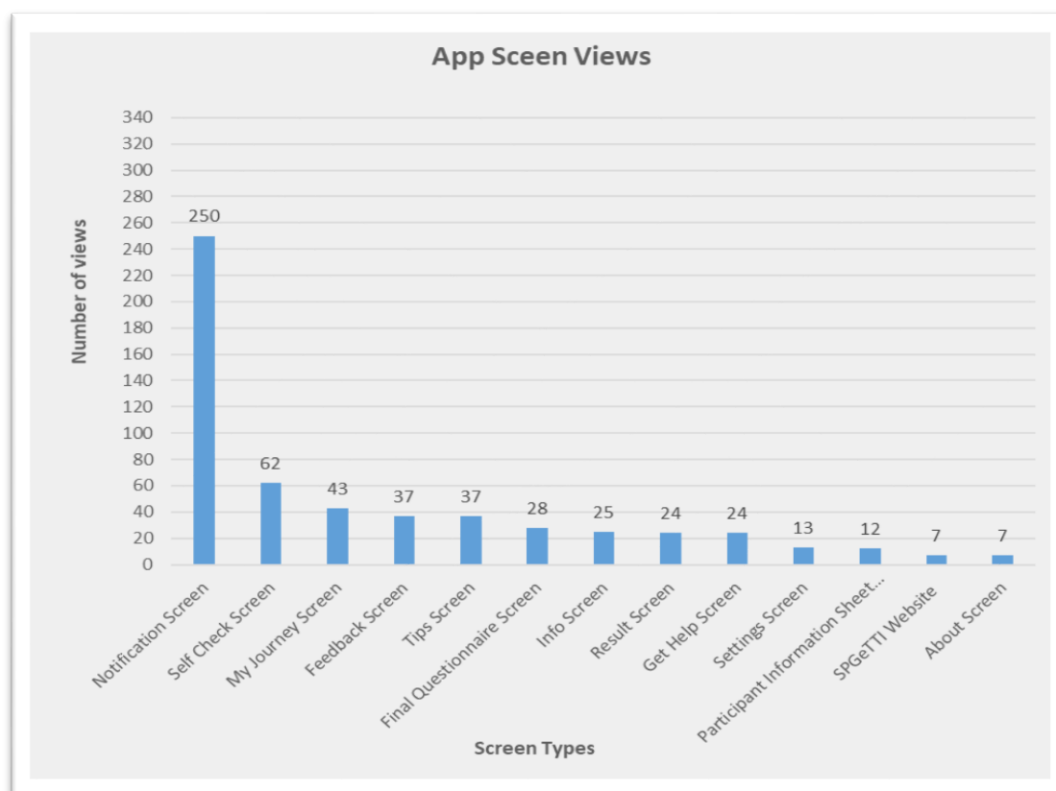
Figure 25. Screen App Views

Only one participant accessed the gambling helpline through the app. While only one participant navigated to one of the external websites available through the Get Help Screen they accessed this link on 6 different occasions.

Feedback

Only three people responded to the Facebook tagged survey with only one respondent saying that they had actually used the app (<5 days). Two respondents suggested that *getting on Wi-Fi* and *I don't want anyone to know I have a gambling problem* as what they thought barriers to the app adoption might be.   Eleven participants provided feedback through the app Feedback Function. Possible responses to the questions were: 1. Strongly agree, 2. Agree, 3. Neutral, 4. Disagree, 5. Strongly disagree. Overall responses were variable with the mean across all responses 3.7 (SD 1.66).

Figure 26 presents the combined participant responses by question.   The key finding of is the response to question 6. SPGeTTI had no effect on my phone battery where the mean score was 3.5 (SD1.8) indicating that the app continued to have a negative impact on the phone's battery.
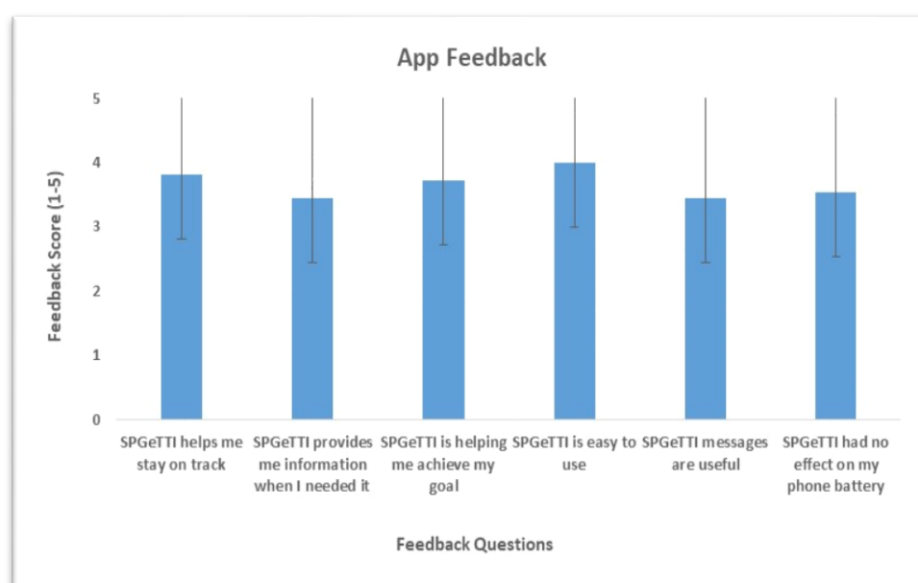
Figure 26. Within App Feedback

There was no feedback provided by SMS and only one by email from someone who had heard of the study but not a participant, and it appears from their comment (below) that they have misunderstood the geolocation element and perceived that the app alerted a participant that they were near a venue.

Has it occurred to you, they are addicted? That's the handiest thing I have heard of to direct them to pokie machines. I can see it now, oh look there's one there!!!

This misconception was also noted very early in discussions with providers and through training, posters, 'cheat sheets" etc., the mode with which the geo-positioning feature worked was such that a notification would only be sent if the person was in the venue.

Despite promoting the 0800 4NIHI number, no voice messages were left. Three of the four participants who completed the study period, also completed the follow-up survey via the link in the app.

The features liked the most were the Daily Messages and the Get Help feature.

Responses to quality of life, stress, and relationships questions were all different with responses from poor to very good.

Focus Groups

As feedback responses from participants were low and the aim was to invite people experiencing gambling harms to a focus group where they were asked to download the app a couple of days before the focus group

and then provide feedback at the group session. Attempts to organise these with help from the gambling services sector during September to December 2018, were unsuccessful. No provider provided any potential participants. As such, the Odyssey House service manager suggested that talking with residential clients could provide some insights albeit they would not be able to download the app due to the "No Phone" rule.

Four focus groups were organised and completed in January 2019.   Hard copy images of the app screens the app logic flow, a small video of how the geolocation function worked and a snapshot of the various notifications were taken to each focus group.   The main domains of enquiry were;

1. Perceived usefulness of an app in general to support being gamble free
2. Perceived usefulness of regular support notifications
3. Features that were perceived as useful and those not useful
4. Barriers to the use of an app to support people with gambling harms
5. Geolocation feature and Just-in-time notifications.
6. New features perceived to be useful
7. Would the app be useful for me?

In total twenty people participated in 4 focus groups. The majority of participants were male (n=16) with a mix of Pasifika (n=5), Māori (3), English (n=1) and NZ European (n=11) ethnicities. All participants were in residential care and while all reported that gambling was a primary addiction, most reported significant co-morbidities including drug and alcohol addictions.

Perceived usefulness of an app in general to support being gamble free

All focus groups began with a general discussion on what they thought of a mobile phone app being a potential tool to support gambling relapse prevention and or reduce harmful gambling. A few commented that it was hard to really give feedback without having used the app itself, however, they all suggested that *a friend in your pocket* like SPGeTTI would be *really useful.* When asked for whom this app would be best directed to, the majority remarked that it would be best for people who were experiencing mild to moderate harms.

> *The further down the rabbit hole I went nothing was going to help until I hit rock bottom. So I think this would work for people before they really get addicted.*

Another participant remarked that they also saw the benefit for himself in that he would be leaving residential care soon and the idea that,

> *An app like this could be, like you said, an angel in my pocket, I think would be really helpful. I don't need to be reminded all the time but*

> *having a prompt when I might be at risk sounds like a great idea for me.*

Most of the participants felt that phones and apps were ubiquitous and so they did not see there being a technology literacy barrier to using an app, but a few participants remarked that if the individual was in debt they may not have a phone at all. In contrast, another participant in another group remarked on access to phones, with,

> *Even when I was at my worst, you know, with no money, people after me to pay for stuff, really ugly yeah, I still had my phone. It sort of kept me connected. I reckon others would be like me. A phone is umm, you know, umm, essential.*

The issue of literacy was raised in all four groups. Concerns raised were about the level of reading skills and if other languages were possible. The Chinese version was shown and all participants thought being able to select your language was important if the app was to reach all those in need,

Perceived usefulness of regular support notifications

Commenting on the notification messages, there were mixed reviews on the content or style of the messages. Some wanted the messages to:

> *Tell it like it is. Like, don't go in there! You are hurting yourself and others. Don't be a loser.*

Whereas others like the positive approach and they liked the current message examples presented as they were supportive and did not *make you feel like you're a failure if you make a mistake.*

 A few participants in two different groups remarked that along with these messages, it *would be good to be able to talk to your counsellor in the app, you know, connect to them If you needed extra help and that. Sometimes you just need to know you are ok from someone who knows you.*

Others were less convinced that this would be useful for them, but did like the idea of a friend or significant other being linked into the app in some way. Overall, there were mixed feelings from the participants on the usefulness of these regular messages. Although one participant commented, *it is hard to really know unless we got them, you know*?

Features that were perceived as useful and those not useful

Overall, the features presented were seen as being useful, and in general all participants thought that the current features were *good ideas.* The issue of not having tried the app to *get a real feel for how it works and if I would like it* was repeated across the groups and is a limitation of the participants in these focus groups.

Just-in-Time

The Just-in-time feature was very positively received and most participants thought that this was a great idea. All participants remarked that anything that could help distract them or deter them for gambling activities of any sort was *fantastic.* The notification sound that signalled an "in-zone" message was played to the participants and the general comment was that it was *too quiet. W*hile this feature is personalisable on all phones in terms of volume and sound type, it did require the individual to make the change. The technical set up that was implemented was the loudest that was permissible. A few participants in one group commented that a siren type sound that would not turn off until *you had left the venue* was an idea. However, a few others in the same group commented that if you knew this was going to happen *then I would just turn the phone's sound to vibrate.* This *probably means that the person is not ready to stop gambling* suggested one participant. Other groups' participants also mentioned similar responses in that, if *I was really on a mission to gamble then I probably would just turn the phone off* and another participant remarked that often she did not take her phone with her when she gambled because,

> *Sometimes I just want to get away from everyone and not be bothered. You know, just to cope, but it wasn't good coping aye, it got me here* [residential program].

 The main outcome from the different discussions on this feature was that it was a good tool to help support action plans to stop gambling, but probably, as one participant said, *not that useful if I wasn't really ready to stop gambling.*

Barriers to the use of an app to support people with gambling harms

There were few comments on what barriers there might be to using a phone app to help stop gambling. *Shame* was a word used in three groups and reflected the groups' participants' feelings of being ashamed to be a problem gambler. Anything that would potentially alert someone that they had a problem with gambling would not be wanted. When the name - SPGeTTI – was discussed, everyone remarked positively on it, as it was sufficiently agnostic and so if someone accidentally saw the app icon, they wouldn't know what it was and so they wouldn't be made to *feel whakamā or ashamed.*

A new comment that had not been mentioned by other participants was made by one participant who said he would not use the app even if given the opportunity. When asked why, he explained his position by saying *I don't want something that could track me everywhere*. Despite explaining how the geo-positioning technology and the gambling zones worked i.e. it only kept in-zone locations, he still remarked that *it wasn't a risk I would take,* and that he *valued his privacy.* It is possible that other potential participants thought

that the geo-positioning element was also tracking everything, and hence were reluctant to participate or use the app.

New features and Ideas

All participants in the four groups wanted a way with which to contact a counsellor to speak with not just have a number to the service (as is currently in the app). This feature was seen as important as there are times that talking with a real person who knew them, may be the only solution to avert a lapse or relapse. However, during the discussions, participants also realised that this could not be possible 24/7. Although, one participant noted that,

> *You know, if you weren't having a crisis, then maybe a message could be left and the counsellor could contact you at their next free time, or something.*

Others remarked that if support wasn't timely then it probably wasn't going to be effective. Although one participant thought that even if you lapsed and gambled, having a counsellor call or contact you when they were able, might help with getting *back on track.*

Other ideas mentioned to include in an app were;

- A calculator or finance tool for budgeting
- Tracking of money spent gambling and prediction of losses over a period
- A forum or online group through the app with others like them
- Something to block online gambling sites available on the phone
- Something I can show my family that I am making progress

5 Discussion

Across a number of fronts, this has been a very challenging research study. Our pre-work and the formative study found that an app was acceptable [38] and yet participant recruitment and retention was significant factor in the study's inability to explore and convey any conclusions on effectiveness. Recruitment through our providers in the first study (RCT) did not work despite numerous meetings. Adjustments such as a reduction in the PGSI score and a researcher being present at clinics (when invited) were as a result of problem-solving with the provider groups. However, these elicited little change to referrals and as such over the course of 6 months, only 17 referrals were received and only four participants completed the four weeks.   It was evident that recruitment via these methods was not successful.

Upon reflection and exploring the research, it is clear that there are many people experiencing harms from gambling that never seek formal support from gambling services. As such, the study was reworked significantly to enable recruitment to be undertaken directly to the individual.   Multimodal advertising and promotion were undertaken and it appears that the story based promotion such as that in the Central Leader and the Indian News were the most successful in attracting potential participants to download the app.   Disappointingly, our conversion rate from download to study completion was 4.2% albeit our drop-out rate was 25%.   These recruitment and retention difficulties are not unusual for studies of problem gamblers. In a systematic review of dropout from psychological treatments for pathological gambling identified 12 studies from five countries they reported a dropout range from 14% to 50%.[39] These findings suggest that new and innovate modalities are needed to both attract and retain problem gambling participants.

Our advertising and promotion of the study was directly focused at the person experiencing the harms. This approach was chosen given the feedback from providers and experts and reflected the participant responses about people experiencing gambling harms are often secretive and hide their gambling behaviour. However, families and friends can be aware that their loved one has a problem. Many service providers include family and friends in the treatment programmes of their clients. A few focus group participants thought that a new feature for the SPGeTTI app was to have a sharing capability where families can provide support and see how a person is progressing. This signalled that we also need to target our advertising to families and friends. Identifying mechanisms for enlisting these social contacts can support and potentially increase the reach of recruitment efforts.

While the technical pre-work found that technically the geo-positioning element was possible during the full technical development phase, it was evident that there were some significant technical barriers to implementing the geo-positioning features and the solution identified, resulted in only developing the app on an Android platform. Our small environmental scan of phone ownership/use by people using electronic gaming machines we found that Android phones were the predominant phone.

Although Android was our app platform we identified issues around the operating system (OS) for older phones. These were the lack of geo-positioning capability within the phone or that the phone had an OS that was 4.1 or older. With the older OS the battery technology was dated and therefore the battery drainage was significant for these devices. This facture made the app unusable for these older phones. Knowing this we managed to ensure that the app functioned on phone OS 4.2 or newer.

However, as has been evident from the limited feedback, the battery drainage remained an issue and it is likely that this played a role in the lack of retention for both the primary clinical trial and the subsequent prospective evaluation study. It is likely that until this the geopositioning element is significantly improved technically in relation to phone battery demand this type of feature will remain out of scope as a tool to support people to avoid gambling zones. Alternatively, exploration into a wearable device that has geo-

positioning technology embedded and which can actively (for example via Bluetooth) synchronise with a participant's mobile phone to generate notifications if the person's location is within a bounded location. This approach would have the battery demand of the geo-positioning feature separate from the phone and hence mitigate the issue of battery drainage. This is being explored as an option.

The notification messages were very positively received and the Messaging feature was the highest feature viewed by participants. While no conclusion can be provided with regard to the impact of receiving and reading these messages, on reducing gambling activity and supporting behavioural change, other studies have reported postivie effect of supportive messages (text and app) in other fields such as tobacco addiction[40], for support in long term conditions such as diabetes[41], improved post surgical patient reported outcomes [42] and in consumer wellbeing and behaviour change.[43]

The combination of in-zone and notifications did result in one participant reducing the time they spent in a venue during the month is positive and suggests further exploration once the geo-positioning feature and battery depletion issues are resolved.

While the translation of the app into Mandarin and Cantonese failed to attract Chinese speaking participants, the need to provide interventions to those affected disproportionately remains important.

In summary the potential of the app was not realised. Despite this, the interest and the enthusiasm remained. It will be essential to reflect on the findings when considering future developments in using mobile apps as a vehicle for supporting people experiencing gambling harms.

6   Publications and Promotion

Chris Bullen 2016 Addiction Symposium Wellington April 28

Gayl Humphrey 2016 Co-design and Development processes of an innovated app for people experiencing gambling harms Health Informatics NZ 2016 Conference, Auckland, November

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