

# Te Rongoā Kākāriki: Kanohi-ki-te-kanohi, e pai ana?

A mixed methods randomised trial of two approaches to the Green Prescription

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## Abbreviations

This is a glossary of the various abbreviations used in this study.

<b>BMI</b>	Body Mass Index
<b>BP</b>	Blood pressure
<b>dL</b>	Decilitre
<b>GRx</b>	Green prescription or script
<b>HbA1c</b>	Glycosylated haemoglobin, a particular form of haemoglobin formed by the addition of glucose to the haemoglobin protein and usually directly related to the amount of sugar in the blood
<b>kg</b>	kilogram
<b>kg/m<sup>2</sup></b>	kilogram per square metre, unit of BMI
<b>mg</b>	milligram
<b>mmHg</b>	millimetres mercury, unit of blood pressure
<b>mmol/L</b>	millimoles per litre
<b>MCHW</b>	Māori Community Health Worker
<b>n</b>	number
<b>RCT</b>	randomised controlled trial
<b>RR</b>	relative risk or ratio
<b>SD</b>	standard deviation
<b>SPARC</b>	Sport and Recreation New Zealand
<b>TOT_HDL (TC/HDL_C)</b>	Total cholesterol/high density lipid cholesterol ratio
<b>T2DM</b>	Type 2 diabetes mellitus
<b>WHO</b>	World Health Organisation
<b>95% CI</b>	95 per cent confidence intervals

## Glossary

This is a glossary of the various Māori and English terms used in this study.

<b>Adherence/compliance</b>	to be conscientious in supporting or following somebody or something (i.e. engagement in the GRx health service)
<b>Ahuatanga</b>	interrelationships between people and the universe
<b>Ako</b>	acquire or learn about information, reciprocal learning, to teach to learn (i.e. the teacher or health professional does not have to be the fountain of all knowledge)
<b>Aotearoa</b>	land of the long white cloud (literal meaning)/New Zealand
<b>Aroha</b>	love, respect, and generosity – collectively the binding force of all that is
<b>Awhi</b>	embrace, assist
<b>Awhinatanga</b>	to embrace or to assist
<b>Central adiposity</b>	excess body fat located around the waist
<b>Culture</b>	traditions, way of life that includes ethnicity, age and gender
<b>Engagement</b>	active participation in the GRx health service study
<b>GRx health service</b>	Green prescription a national physical activity and health service. The words GRx lifestyle intervention, GRx treatment, GRx programme or GRx health initiative are also used in this body of work to reflect specific phases in this body of work
<b>Hapu</b>	sub-tribe
<b>Hauora</b>	health, spirit of life or vigour, health and wellbeing
<b>Hōha</b>	nuisance
<b>Io Matua Kore</b>	God
<b>Iwi</b>	tribal group, people or bones or Māori people
<b>Kai</b>	food; to eat
<b>Kaimoana</b>	seafood
<b>Kaiwhakahaere</b>	facilitator, mentor, or support person, refers to the Māori GRx coordinator in this research project
<b>Kapa haka</b>	group performing arts or culture display

<b>Kanohi i kitea</b>	a face seen
<b>Kanohi-ki-te-kanohi</b>	face-to-face
<b>Karakia</b>	incantation/prayers
<b>Kaupapa</b>	rationale
<b>Kaupapa Māori</b>	Māori philosophy (is related to being Māori and includes Māori culture, principles, values, knowledge and language as valid and legitimate)
<b>Kauwhau</b>	moralistic tale
<b>Kia piki ake i nga raruraru o te kainga</b>	mediation of socio-economic and home difficulties
<b>Kina</b>	sea urchins
<b>Koeke/kaumatua</b>	elders
<b>Koha</b>	gift
<b>Kuku/kutai</b>	mussels
<b>Koura</b>	crayfish
<b>Mamae</b>	pain, hurt, sore
<b>Mana</b>	prestige or integrity
<b>Manaaki</b>	generous, caring or nurturing
<b>Manaakitanga</b>	to nurture relationships or to look after people
<b>Māori</b>	indigenous people of Aotearoa New Zealand
<b>Mihi</b>	to greet
<b>Marae</b>	space to meet
<b>Moteatea</b>	poetry
<b>Obesity</b>	excess body fat
<b>Non-Māori</b>	New Zealander of English and/or European descent
<b>Pakiwaitara</b>	story
<b>Pikitia ngā maunga</b>	overcoming barriers
<b>Pātaka mātauranga</b>	sharing knowledge
<b>Pikopiko</b>	fern fronds/tips
<b>Pipi (Phaphies australis)</b>	shellfish found in the sandy banks near the mouth of estuaries, and harbours where there is considerable water flow
<b>Pounamu</b>	greenstone
<b>Pouri</b>	sadness, unhappiness

<b>Pumanawa</b>	‘heart’ a feeling that your heart is good or you are a good person
<b>Researcher/interviewer</b>	author and primary investigator of this body of work
<b>Tane-nui-a-rangi</b>	Māori God of the sky
<b>Tangata whenua</b>	people of the land
<b>Taonga</b>	treasures, special
<b>Taonga tuku iho</b>	cultural aspirations from ancestors that pass from one generation to the next
<b>Te Ao Māori</b>	worldview of Māori
<b>Te Kohanga Reo</b>	nesting place of language (Māori), total immersion early childhood learning centred on Māori language, culture, and traditions
<b>Te Kura Kaupapa</b>	school environment (primary, intermediate and secondary) centred on Māori language, culture, and traditional learning outcomes.
<b>Te Reo</b>	language (referring to Māori language)
<b>Te Rongoā Kākāriki</b>	Green prescription (GRx) programme
<b>Te Whare Tapa Wha</b>	Māori health model reflects four dimensions of health (te taha hinengaro, te taha tinana, te taha wairua, te taha whānau)
<b>Te taha hinengaro</b>	dimension of health includes the psychic, mind, thoughts
<b>Te taha tinana</b>	dimension of health includes the body, physiology, biology
<b>Te taha wairua</b>	dimension of health includes the spirit, spirituality
<b>Te taha whānau</b>	dimension of health includes the family, community, collective
<b>Tiaki model</b>	Māori ‘mentor’ research model where the research process is guided and mediated by authoritative Māori people
<b>Tino rangatiratanga</b>	self-determination of Māori culture
<b>Tuakana/teina</b>	older sibling same gender/younger sibling same gender
<b>Tuatua/pipi</b>	cockles
<b>Tiriti o Waitangi</b>	Treaty of Waitangi – founding document between the crown and Māori
<b>Uptake</b>	to engage, participate or do, to participate in the GRx programme

<b>Urupa</b>	cemetery
<b>Waiata</b>	song
<b>Wairua</b>	soul/spirit
<b>Wairuatanga</b>	spirituality
<b>Whakamana</b>	empowerment/self-efficacy
<b>Whakapapa</b>	genealogy/family background
<b>Whāngai model</b>	Māori ‘adoption’ research model refers to where a family member happens to be doing research
<b>Whānau</b>	family/extended family
<b>Whānaungātanga</b>	relationships, embracing relationships
<b>Whakawhānaungātanga</b>	strengthening family/social relationships
<b>Whenua</b>	environment, land

## **Attestation of Authorship**

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgments), nor material which, to a substantial extent, has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Signed:



Date: 09 April 2015

## **Conferences, meetings and reports**

1. KAI mo Hauora: Knowledge and Insights for Health 2012. The Inaugural Māori Nutrition and Physical Activity Research Hui, Massey University, Palmerston North, New Zealand, 28-29 August, 2012. Invited Guest Speaker.
2. MAI Doctoral Conference, Whakatane, New Zealand, 28-29 November, 2011. Oral presentation.
3. 5<sup>th</sup> International Council of Women (ICW-CIF) Asia-Pacific Regional Council Seminar and Training Workshop, Nadi – Fiji, 14-17 November, 2011. Oral presentation
4. Australian and New Zealand Obesity Society, 21<sup>st</sup> Annual Scientific Meeting, Adelaide, South Australia, 20-23 October, 2011. Attendee at AGM. Oral presentation.
5. 2<sup>nd</sup> Māori Mai, Māori Atu Hui-a-Tau: He Ara Whakamua (Pathways forward), Hamilton, New Zealand, 11-12 August, 2011. Oral presentation
6. A grant reviewer for the Health Research Council of New Zealand, April 2011.
7. Australian and New Zealand Obesity Society, 20<sup>th</sup> Annual Scientific Meeting, Sydney, Australia, 20-23 October, 2010. Attendee at AGM. Oral presentation.
8. Nga Pae o te Maramatanga, 4<sup>th</sup> International Indigenous Conference Matauranga Taketake: Traditional knowledge, Auckland, Aotearoa/New Zealand. 2010. Oral presentation.
9. Te Hotu Manawa Māori National Conference, 19-20 October, 2010, Martinborough, New Zealand. Oral presentation
10. MAI Doctoral Conference, 18-20 October, 2010, Wellington, New Zealand. Attendee.
11. Auckland University of Technology, Postgraduate Research Symposium, Auckland, New Zealand, 2010.

12. Invited guest speaker to the Australian and New Zealand Obesity Society, 17<sup>th</sup> Annual Scientific Meeting, 23-25 October, 2009, Melbourne, Australia
13. Te Hotu Manawa Māori National Conference, 19-21 October, 2009 Whakatane, New Zealand. Oral presentation
14. Te Hotu Manawa Māori National Conference, 19-21 October, 2009 Whakatane, New Zealand. Video competition of the GRx delivered in this research study
15. Quarterly reports about research progress provided to New Zealand Ministry of Health (included a working manual entitled: ‘increasing the uptake of physical activity, a booklet entitled GRx success stories and video of the GRx delivered in this GRx research study)
16. Health Research Council (HRC) Career Development Award: Māori Health PhD Scholarship (11.12.08)
17. Te Hotu Manawa Māori National Conference, 2008, Manukau, New Zealand. Oral presentation

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To our **participants**, thank you for your time and effort, in particular for allowing me into your lives and homes. May you be well and, yes, it is finally written!

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This body of work (thesis) contributes to the writings of other Māori scholars focused on improving the health and well-being of our people, and is likely to be shared among other peoples. Therefore, it is pleasing to announce that some findings from this body of work were offered to community members beyond those eligible and the time-frame

of this body of work. Three examples are: Sport Waikato clients receive an initial kanohi-ki-te-kanohi (face-to-face) interview at the point of entry into the Sport Waikato Green Prescription (GRx) health service, the Māori GRx kaiwhakahaere (facilitator) who delivered the delivery modes (waea/telephone or kanohi-ki-te-kanohi/face-to-face) retained employment and the engagement of Māori eligible for a GRx increased more than three-fold since the inception of this body of work and, now informs other Regional Sports Trust GRx health services (personal communication Stephanie McLennan).

In memoriam: Matua Morehu (Buddy) Te Whare, Matua Timi Te Heu Heu and, my dad, Whakahau (Buff) Williams. Each was a man of vision whom imparted knowledge, confidence and humility in many. They were men who walked their talk and, each left a legacy for future generations to consolidate.

To conclude, I leave a whakatauki that was gifted to me in recognition of my academic and life journey.

“Akatea kimihia, Akatea ka kitea”

A vine (akatea) travels many paths to reach its objective of bearing fruit; the key to independent good health is a supported and nurtured path.

Author: T. Te Amo

## **Abstract**

In Aotearoa New Zealand the prevalence of Type 2 diabetes mellitus (T2DM) is three times higher for Māori than New Zealand European and is increasing. Participation of Māori newly diagnosed with T2DM with the Te Rongoā Kākāriki (Green Prescription, GRx) health service is lower than for New Zealand European. This thesis has four linked aims: i) to examine differences in the engagement and active participation (adherence) (Chapter 4), ii) to compare changes in physical and metabolic measures (Chapter 5) using a kanohi-ki-te-kanohi (face-to-face) mode of delivery or waea (telephone) for Māori and New Zealand European, iii) to better understand the perceptions, knowledge and activities of the participants that enabled them to participate (Chapter 6) and iv) to understand better how participants make and maintain lifestyle changes through the GRx health service.

This GRx research study was a randomised trial (ACTRN012605000622606) using a kaupapa Māori framework and research principles, with a mixed methods approach, in which Māori and New Zealand European women and men newly diagnosed with T2DM were randomised to either kanohi-ki-te-kanohi (face-to-face) mode of delivery or waea (telephone) for six months. Physical and metabolic measurements were made, questionnaires completed and interviews undertaken at baseline, six and 12 months. After 12 months medical records were accessed for glycated haemoglobin (HbA1c) and lipid measures associated with metabolic risk. Analysis of variance (ANOVA) was used to examine for differences among the categorical variables of ethnicity, mode of delivery and gender.

A total of 152 (96 women, 56 men) participants aged 30-86 years consented to participate and completed baseline measurements. Recruitment was less than the target

(240), but equal numbers of Māori and New Zealand European were recruited, from GRx referrals that were predominantly non-Māori. The participants included 68 Māori, 70 New Zealand European and 14 ‘Other’ (neither Māori nor New Zealand European). The main findings excluded the ‘Other’ group. More New Zealand European than Māori remained in the randomised trial at six (74% vs. 51%) and 12-months (56% vs. 30%), respectively. There was a trend for more participants to remain in the kanohi-ki-te-kanohi (face-to-face) (68%) compared with the waea (telephone) (58%) mode of delivery at six months.

The physical and metabolic data revealed that at the end of the 6-month GRx intervention, for 88 participants, body weight was reduced by 1.6 kg (95% CI, 0.3 to 2.8) and waist circumference by 3.6 cm (95% CI, 2.4 to 4.9). At six months, of the 63 who had HbA1c measured there was a reduction of 1.3% (95% CI, 0.3 to 2.4). No differences by GRx mode of delivery, ethnicity or gender were observed in these analyses. At the 12-month follow-up, for the 59 participants measured (20 Māori and 39 New Zealand European), the body weight and waist circumference measures were reduced from baseline by 2.3 kg (95% CI, 0.5 to 4.0) and 5.5 cm (95% CI, 3.4 to 7.6), respectively. In 36 participants (12 Māori and 24 New Zealand European) the HbA1c was reduced by 0.6% (95% CI, 0.0 to 1.3). No differences for GRx mode of delivery, ethnicity or gender were observed. In general, improvements in physical characteristics were associated with improvements in HbA1c concentrations. The greatest improvement was in those who had higher HbA1c (worse glycaemic control) at baseline.

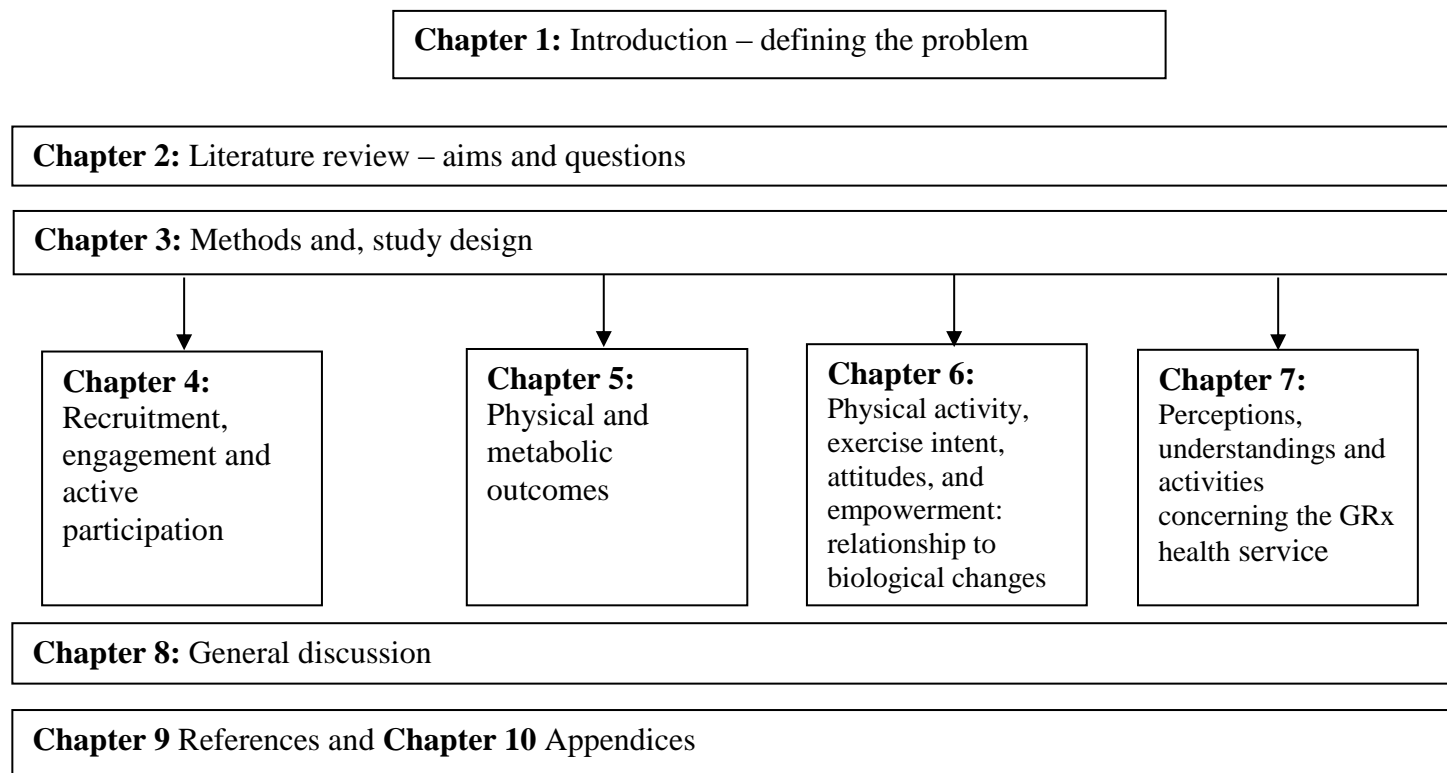
Data from the questionnaires showed that most participants were inactive at baseline ( $\leq$  30 min/day) and 25% reportedly increased their participation in walking activities at six and 12 months with no differences noted between mode of delivery, ethnic groups or

gender. Overall, no changes in intensity and time spent in physical activity were found between six and 12 months. Optimism and positive self-belief in ability to manage their diabetes did not change. However, a small association was found between the changes in the perceived need for special training and changes in body weight, waist circumference and the diabetes empowerment score.

Five key themes from the interviews, in relation to improved self-management of T2DM, were found. The themes involved: **whānaungātanga**: strengthening relationships; **pātaka mātauranga**: sharing knowledge; **whakamana**: empowerment; **manaakitanga**: giving and receiving support and assistance from others and **pikitia ngā maunga**: overcoming barriers. A shared responsibility of the participants, the researcher and Māori GRx kaiwhakahaere, including the general practitioner and/or practice nurse to communicate better and overcome barriers, was identified. Kanohi-ki-te-kanohi (face-to-face) was the preferred approach to GRx even though there were no differences in metabolic/physical outcomes with mode of delivery. Overall, participants endorsed that the initial kanohi-ki-te-kanohi (face-to-face) contact was instrumental to their understanding and participation.

To conclude, the GRx health service delivered by Sport Waikato Regional Sports Trust was associated with comparable improvements in HbA1c and weight among Māori and New Zealand European with no difference between the two modes of delivery. Kanohi-ki-te-kanohi (face-to-face) contact was the preferred approach to GRx. Participation by Māori once referred was relatively high and probably higher than New Zealand European, but with high drop-out. Understanding of GRx was poor prior to entering the service. The major hurdle to GRx uptake among Māori appears to be in primary care.

Primary care needs to improve their explanation of GRx and their linkage with the GRx programme. New strategies are required to maintain participation.



*Figure 1.0.1.* Flow chart of an overview of the thesis

## Chapter 1 Introduction

The driving force in this thesis (body of work) was to understand better ways of increasing participation of Māori adults newly diagnosed with Type 2 diabetes mellitus (T2DM) in a lifestyle intervention such as the Te Rongoā Kākāriki (Green Prescription, GRx) health service. Figure 1 provides a snapshot of how the thesis unfolds. Type 2 diabetes mellitus is an epidemic in many countries, and is expected to double worldwide in the next generation (Alberti & Zimmet, 1988; Danaei et al., 2011; Joshy & Simmons, 2006; Zimmet, Shaw, & Alberti, 2003). Prevalence rates are generally higher in indigenous populations than in people of European origin (Bredahl & Roessler, 2011; Damin, Bailie, & Wang, 2010). In Aotearoa New Zealand, the prevalence of T2DM is three-fold higher in Māori than New Zealand European while mortality rates in the 40-65 year age group are nearly ten times higher for Māori (Joshy, Lawrenson, & Simmons, 2008; Joshy & Simmons, 2006; Ministry of Health, 2008). Increased prevalence rates of accumulated excess body fat, otherwise referred to as obesity, has influenced T2DM to reach epidemic proportions (Damin et al., 2010; Joshy & Simmons, 2006; Ministry of Health, 2008; Simmons, 1996). Other health risk factors for T2DM include hypertension and dyslipidaemia. These are also firmly linked to coronary heart disease and stroke (World Health Organisation, 2000, 2003, 2009). An alarming outcome of these risk factors is that the lifespan can be shortened by up to 15 years (Gillies et al., 2007; Joshy & Simmons, 2006; Simmons, 1996). Furthermore, up to 75% of people newly diagnosed with T2DM may die from heart-related disease, high blood pressure, high cholesterol levels and renal diseases if untreated (Joshy & Simmons, 2006; Simmons, 1996). Māori with T2DM were thirteen-fold more susceptible to dying from renal failure than New Zealand European and Pacific Islander Polynesians (Ministry of Health, 2008). Other studies have shown that these health risks are precipitated by

insufficient physical activity for long periods of time, excess weight and weight gain perhaps through the consumption of less nutritious foods. This is heavily influenced by an environment that promotes excessive food intake and discourages active participation in physical activity (Ministry of Health, 2008, 2012b; Swinburn et al., 2009; Wang et al., 2009).

In an attempt to lower the prevalence rates of T2DM and related health risks, much time and money has been invested in a number of interventions, which include pharmacological, lifestyle, surgical and herbal remedies. However, the treatment of choice is a lifestyle approach which is typically delivered in communities by primary care health providers (Gillies et al., 2007; Sorensen, Skovgaard, & Puggaard, 2006; Swinburn, Walter, Arroll, Tilyard, & Russell, 1998). A key factor of successful lifestyle approaches is that intensive counselling is delivered by a bona fide health worker. The health worker's responsibility is to provide information to the patient about ways of managing their health needs, such as blood sugar control for those with pre-existing diabetes, through physical activity and eating appropriate quantities of nutritious foods (Elley & Kenealy, 2009; Elley, Kerse, Arroll, & Robinson, 2003; Kerse, Elley, Robinson, & Arroll, 2005; Swinburn, Walter, Arroll, et al., 1998). Such health needs require patients and/or participants to set goals including those related to any medical complaints (Barnett, 2004; Diabetes Prevention Program Research Group, 2004; Hansen, Olivarius Nde, Siersma, Drivsholm, & Andersen, 2004; Rush, Cumin, Migriauli, Ferguson, & Plank, 2009). An example of a goal for those with diabetes would be to achieve and maintain appropriate blood glucose concentrations, offset by incremental or smaller goals, including weight loss or reduction in waist circumference. Achieving goals set for increasing physical activity and/or improving the consumption of nutritious foods is reported to reduce insulin resistance and improve blood glucose

concentrations in both. Evidence is reported in a number of international (Barnett, 2004; Corser, Holmes-Rovner, Lein, & Gossain, 2007) and national studies (Kerse et al., 2005; Swinburn, Walter, Arroll, et al., 1998). In Aotearoa New Zealand there are indications that success in goal setting can be associated with measurable changes in aspects of biology, physical activity, knowledge and attitudes about good health. Ideal achievements of measurable changes in biology, knowledge and attitudes are associated with body weight reduction through increased physical activity. Increased physical activity can be assessed by how often exercise occurs (frequency), increases in heart rate, depth of breathing (i.e. exercise intensity) and length of time or distance (i.e. cardiac exercise duration) (Swinburn et al., 2009; Swinburn, Walter, Arroll, et al., 1998). Other goals are associated with increased and applied nutritional knowledge concerned with dietary fat, proportion of total energy used, and saturated fat and fibre intake in daily routines (Swinburn, Walter, Arroll, et al., 1998). These are important aspects for improved glycaemic control (blood glucose control) at all stages of diabetes, even once treatment with oral medication or insulin has commenced. Moreover, understanding about the psychological adjustments to having diabetes, the motivation to change and growth in self-efficacy are central for lifestyle interventions to improve glycaemic control (R. M. Anderson, Funnell, Fitzgerald, & Marrero, 2000; Bandura, 1977; Barbosa, Arnould, Gruenberger, & Schwarz, 2011). However, many of these studies have not integrated the perspective of the participant (Barbosa et al., 2011). Hence, there is a need to integrate the viewpoints of the health professionals and participants, as a means to improve and maintain healthy behaviours. Some studies have reported the importance of integrating participants' views as part of the process of improving an intervention (Elley, Kerse, Arroll, et al., 2003; Patel, Schofield, Kolt, & Keogh, 2011; Pringle, 2008). This evaluative approach would also address how well lifestyle

interventions had reached potential participants and, if not, then the research question would be how come or why? A possible response is that the natural flow of lifestyle in everyone is complex for example prevention and lifestyle among those living with diabetes.

Strategies for improvement in all health services (initiatives) should begin with an appreciation of recommended best practice and current practice approaches in diabetes. Development of such strategies should include the participant, health care workers, and researchers. There is an assumption that the health provider and their employees would, collectively, have the resources and skills to assess and prepare a management plan that encompasses an understanding of the participants' cultural, socio-economic and support networks, alongside their medical complaints (Ellison-Loschmann & Pearce, 2006; Gillies et al., 2007). Culture-centred and ethics publications have identified the importance of health professionals (and researchers) acknowledging cultural and socio-economic realities and the availability of support networks (Hudson, Milne, Reynolds, Russell, & Smith, 2008, 2010; L. T. Smith, 1999, 2012). While many may presume that 'this concept is not new', it remains important for the health professional and researcher to assess their own worldviews (i.e. values, beliefs and attitudes) as a means of understanding and showing empathy to others (Hudson et al., 2008, 2010; L. T. Smith, 1999, 2012; Sue & Dhindsa, 2006). The underlying principle is to ensure that the perceptions and experiences of the participant are heard, and not misinterpreted, by the health professional and/or researcher (Cram, Phillips, Tipene-Matua, Parsons, & Taupo, 2004; Hudson et al., 2008, 2010; L. T. Smith, 1999, 2012). It is clear in the culture-centred and ethics literature that the ability to respect values and belief systems among peoples can lead to trust and enhance the integrity of all involved (Hudson et al., 2008, 2010; L. T. Smith, 1999, 2012). When people feel they are being heard, or listened to, it

is more likely they will feel comfortable, safe and respected by the health professional or researcher. A likely consequence of this is that the participant accesses, engages and participates in the health service and research. Therefore, approaches that respect and value the participants, health professionals and researchers would be seen as a priority to advancing knowledge throughout in this thesis and to achieving an equitable representation of Māori and New Zealand European participation in the research. Strategies applied to maximise participation of both ethnic groups in this research (randomised trial) will be addressed in the ‘ways of knowing’ section.

In Aotearoa New Zealand a number of lifestyle intervention approaches exist. However, the focus of this research is on the Green Prescription (GRx) programme, a national programme to promote lifestyle change. Patients referred to the GRx health service present with medical conditions such as diabetes, obesity and cardiovascular disease that would benefit from increased physical activity and improved nutrition. National evaluations have shown that few Māori accessed and/or participated in the GRx health service (Pringle, 2008; van Aalst & Daly, 2006), in contrast to New Zealand Europeans, who had higher participation rates (Pringle, 2008; van Aalst & Daly, 2006). Similar results for Māori were found in a yet to be published preliminary study conducted by the researcher (see Section 2.3.3: Te Wai o Rona: Diabetes Prevention Strategy). That is, very few Māori accessed or participated in the national and, modified, GRx health service (Williams, Rush, Crook, & Simmons, 2009). The primary reason for non-participation in Te Wai o Rona: Diabetes Prevention Strategy, where the GRx intervention was kanohi-ki-te-kanohi (face-to-face), was the failure of primary care to refer, even when cost barriers were removed. In the national programme, the major hurdle was regarded to be the absence of seeing a person/face rather than speaking to a stranger through the telephone. That is, with the traditional national GRx health service

one-on-one telephone advice is provided about ways to engage in physical activity and how to choose nutritious foods. However, at no time does the participant physically meet the health service provider. The only contact is via telephone. A starting point for this research was to explore what is known about how a person-centred, culture-centred approach together with contextual interactions may achieve the successful recruitment, engagement and active participation of Māori newly diagnosed with T2DM.

My father was diagnosed with T2DM. He died from a heart attack aged 54. On reflection, he presented with symptoms identified as high risk factors for cardiovascular disease. These risk factors included cigarette smoking, accumulated excess body weight and abdominal obesity, as well as a family history of cardiovascular disease. It was his death that initiated and maintains my focus to complete this thesis. Furthermore, I wish to uphold the integrity of the present randomised trial (also referred to as the GRx research study or research study or this body of work) and the Te Wai o Rona: DPS – GRx study (preliminary study) by completing the thesis. That is, I interviewed individuals whom shared their stories about living with T2DM as a means to optimise satisfactory blood glucose treatment in the GRx health service.

In summary, it is clear that T2DM and obesity are on the rise and can lead to people dying earlier through poor glycaemic (blood glucose) control (Ministry of Health, 2012a, 2012b). Once diagnosed with T2DM many individuals fail to achieve recommended glycosylated haemoglobin (HbA1c) goals or, alternately, struggle to maintain good weight and blood glucose control (Barnett, 2004). The initial treatment for managing blood glucose levels and the associated risk factors is a lifestyle intervention. In Aotearoa New Zealand one national lifestyle intervention, the GRx health service, has been found to have promising results and to be cost effective for New Zealand

Europeans (Elley, Kerse, Arroll, et al., 2003; Elley, Kerse, Arroll, & Robinson, 2004). Despite such evidence, it is neither readily accessed nor utilised by Māori. Arguably, the true success of a lifestyle intervention approach is how well it can reach, engage and sustain healthy behaviours for all involved. The inclusion and valuing of culture (including ethnicity, age and gender) and ethical variables are seen as important when assessing ways to increase active participation by Māori in the modified GRx health service. These factors are also essential for achieving equal representation of both Māori and New Zealand European in this research study.

The overarching responsibility falls on health professionals/workers and researchers to share and translate healthful knowledge that may reach all adults living in New Zealand. Therefore, another key concept in this body of work was to assess and to include ways that would increase Māori participation and, more pertinently, to share the information found. This information would extend the already established critical mass about lifestyle interventions. What is unique about this body of work is that it is the first, to the researcher's knowledge, randomised trial conducted by an emerging Māori health researcher to evaluate the perceptions of Māori and New Zealand European of a modified version of the GRx health service in Aotearoa New Zealand.

This introduction has provided a brief background to the overall placement of this body of work. It has briefly covered the problems: the number of Māori with T2DM and the loss of length and quality of life, and how lifestyle interventions and best practice guidelines can encourage potential participants, in particular Māori, to access and participate in the GRx lifestyle interventions that may be part of the solution. More in-depth details about how lifestyle changes can reduce the burden of the disease will follow. Next, a selected group of randomised controlled trials featuring lifestyle

interventions designed to prevent, delay and/or treat T2DM will be compared. The literature review will conclude with the research aims and questions. These aims will lead into the research design ‘ways of knowing’ and methods ‘how the information was gathered and analysed’ sections so that the randomised trial would be attractive for Māori to participate. It is the intent to share and translate the knowledge found from the body of work and experience from this thesis into positive health gains for Māori and New Zealand Europeans living in New Zealand, among others.

## Chapter 2 Literature Review

*The Māori of old was lean, sinewy, tough and mentally active. He lived the natural, open, out-doors life, and thus was always in the best of physical condition. Those who reached maturity were literally the fittest of their race, for no weakling could survive the hardship and exposure of their primitive life. (Pomare, 1909)*

Traditionally, Māori of old living in Aotearoa New Zealand were renowned as hunters and gatherers and were referred to as tangata whenua (people of the land). Māori sourced their food items from their local and natural environment (Kuhnlein & Receveur, 1996). The availability of foods, historically and currently, are dependent on the environment and moderated by technology and politics (Rush, Hsi, Ferguson, Williams, & Simmons, 2004). The right to have access to sufficient, safe and nutritious food to maintain a healthy and active life is termed food security (Pinstrup-Andersen, 2009). Food security primarily considers access and availability to nutritional food for people in a given environment. Traditional foods, for Māori and other indigenous ethnic groups, are considered part of a healthy lifestyle, healthy because of the physical activity required in hunting, cultivating and harvesting food (Rush et al., 2004). Before colonisation, the Māori diet was high in protein, low in fat and high in dietary fibre, while modern westernised diets are described as high in fat and refined carbohydrate (Tseng, 2005; Uusitalo et al., 2005). The consumption of less nutritious foods coupled with a physically inactive lifestyle is clearly associated with high and increased rates of accumulated excess body fat (Ministry of Health, 1999, 2008; Swinburn, Walter, Ricketts, et al., 1998), along with increased insulin resistance and a high prevalence of T2DM (Joshy & Simmons, 2006; Simmons, 1996). The major health issues associated with an inactive lifestyle and eating less nutritious food ultimately include increased risks of morbidity and mortality (Joshy & Simmons, 2006; Simmons, 1996; Tahrani,

Bailey, Del Prato, & Barnett, 2011) and other health complications such as heart diseases. (Joshy & Simmons, 2006; Simmons, 1996; Woods, 2011). Furthermore, innovative strategies to encourage regular physical activity and to eat nutritious foods in an inactive population have been well documented (T. G. Pavey, N. Anokye, et al., 2011; Swinburn, Walter, Arroll, et al., 1998; The Look Ahead Research Group, 2013). Notably, few Māori participated in lifestyle programmes to improve health, in particular, the GRx (Pringle, 2008). Therefore, the over-riding gap identified earlier is to provide ‘ways of knowing’ to increase the number of potential Māori participants to achieve an equal or greater representation in the intervention alongside New Zealand Europeans. In a best practice approach for Māori people with T2DM, the health professional should account for factors related to Māori worldviews. Such worldviews have been captured in Māori models of health, where the importance of whānau (families and community), culture, spirituality, the environment and socioeconomic factors, are integrated (M. H. Durie, 2000, 2001). Such an approach, deemed healthy for Māori, is holistic; this is expanded on in more detail in Section 2.1. Equally important to note, is that Māori are a diverse group of people and more/less likely to present with common behaviour patterns than New Zealand Europeans (M. H. Durie, 2001). The point here is that an understanding of the individual in their environment needs to be considered as part of communicating their treatment plan and improving their health literacy. There appears to be limited empirical evidence on which to base recommendations for Māori living with T2DM who participate in national lifestyle interventions. The Ministry of Health in Aotearoa New Zealand acknowledges the importance of reducing health inequities and improving Māori health by documenting these as key objectives in the New Zealand Public Health and Disability Act (2000) (the Act). This commitment is also confirmed in their recent Statement of Intent document, which focuses on how to

deliver and provide better care for Māori living with long term illnesses (Ministry of Health, 2012d), as reported in the New Zealand Health and Nutrition Survey (Ministry of Health, 2008). Other health policy documents, with an emphasis of improving healthful relationships with Māori, include The Treaty of Waitangi with its principles of partnership, participation and protection (M. H. Durie, 1989) and He Korowai Oranga: Māori (Ministry of Health, 2002a), both of which are designed to first reach Māori, and then New Zealand Europeans. These principles are typically delivered by the Māori Planning and Funding departments within District Health Boards and Māori health providers. The ultimate goal, again, is to meet the objectives of reducing Māori health inequalities based on social, ethnic, racial or economic disparity in Aotearoa New Zealand. However, the objectives of such documentation can only be implemented by those willing to do so.

## **2.1 Māori models of health**

Māori models of health generally concede whānau (extended family) is the foundation of Māori society (M. H. Durie, 1985, 2001; Ministry of Health, 2002a). One model, Te Whare Tapa Wha (four-sided house), is widely recognised as a theory of well-being among Māori. It represents four dimensions, which include te taha wairua (a spiritual dimension), te taha hinengaro (mind/intellect dimension), te taha tinana (a bodily dimension), and te taha whānau (a family dimension). Collectively, these dimensions are interrelated and work in harmony to influence health (M. H. Durie, 1985, 2001). Durie adds that priorities for health are often debated between Māori elders and those working for the mainstream culture. Mainstream health professionals appear to prioritise the individual and socio-economic inequalities, while Māori concerns reflect wider cultural and environmental factors affecting their community, land and water, as a whole. A lack of confidence in mainstream child rearing techniques has also aroused

Māori adults into advocating traditional practices with less dependence on biological parents and more on extended adult whanau (family) being responsive to the needs of their tribal affiliates/iwi (people). Any large scale intervention aimed at promoting health among Māori people must involve the elders and may need to accept alternative goals and methods that are relevant to current Māori world views and intellectual traditions.

In the following section the researcher will, first, provide details on three behavioural health-related risk factors associated with T2DM in Aotearoa New Zealand. These include insufficient physical activity, food security and obesity (accumulated excess body fat). Each is leveraged through a need to manage blood glucose concentration across the lifespan. The second section will describe selected randomised clinical trials that focus on lifestyle interventions with indigenous populations designed to prevent, delay and treat T2DM. The third section will refer to research principles associated with a kaupapa Māori methodological approach underpinned by Treaty of Waitangi principles such as partnership, participation and protection. This literature review will conclude with the formulation of the research aims driving this body of work. An overall vision of this GRx research study is to provide knowledge that may be translated into positive health gains for Māori towards managing the risk factors associated with newly diagnosed T2DM among New Zealanders living in Aotearoa.

## **2.2 Insulin resistance trajectory**

The development of insulin resistance in the setting of an inherited predisposition, which then leads to T2DM, can be predicted from risk factors, such as the accumulated effects of insufficient physical activity, poor nutrition and excess energy intake and body fat (obesity). Conversely, it is thought that the health of an individual presenting

with increased insulin resistance can be improved through increased physical activity, improvement in the amount and nutritional quality of the diet and weight loss. These three risk factors, in turn, are presented to describe how changes may be associated with improvements in health and quality of life for people diagnosed with T2DM.

### **2.2.1 Insufficient physical activity**

Physical activity is, typically, defined as any voluntary movement that includes activities in daily life, such as walking, gardening and swimming, or work related activities (Kahn et al., 2002; World Health Organisation & International Diabetes Federation, 2006). The effect of physical activity is greatest in people at high risk of developing and/or newly diagnosed with T2DM (Trappenburg et al., 2013). Conversely, insufficient physical activity is defined as fewer than five times of 30 min of moderate activity per week, or fewer than three times of 20 min of vigorous activity per week, or the equivalent (World Health Organisation, 2003, 2010). In general, physical activity that increases the heart rate and depth of breathing to at least three times that of resting energy expenditure is sufficient for cardiovascular or metabolic health (Ministry of Health, 2008; World Health Organisation, 2003, 2010). In this section the impact of insufficient physical activity linked to increased risks of T2DM on Māori and New Zealand European living in Aotearoa New Zealand is investigated.

One national programme that aimed to increase physical activity in the general population was the national Push Play campaign developed in 1999. This was in response to a study which showed a high prevalence of physical inactivity among New Zealand women (60+ yr). Two thirds of these women wanted to participate in any kind of physical activity, while one third did not (Galgali, Norton, & Campbell, 1998). Other aims of such campaigns were also to increase awareness of the benefits of physical

activity and encourage all adult New Zealanders and their families to become more active (Bauman et al., 2003; Croteau, Schofield, & McLean, 2006). Evaluation of the programme showed significant increases in the numbers of adults who intended to be more active, from 1.8%, in 1999, to 9.4%, in 2002.

Yet there were no sustained changes in physical activity levels in subsequent evaluations. In 1999, more than 39% reported 5+days activity per week, in 2000, this increased to 45%. In 2002, however, it dropped back to 38% (Sport and Recreation New Zealand, 2003). The Hillary Commission and Sports and Recreation New Zealand (SPARC) conducted further surveys, which identified a 3% increase in the proportion of adults who were active for at least 150 min per week (Sport and Recreation New Zealand, 2003). This was consistent with the findings of the self-reported physical activity gathered by the Hillary Commission and/or SPARC (Sport and Recreation New Zealand, 2003). A New Zealand workforce study that used the 10,000 steps a day model showed 43% of the study participants averaged more than 10,000 steps per day (Schofield, Badlands, & Oliver, 2005). That study identified that 13% of the respondents received physical activity advice, while 3% reported receiving a GRx script from a general practitioner or a practice nurse (Croteau et al., 2006).

Over the last 15 years, compelling evidence from larger prospective studies has shown the need for regular physical activity and adequate levels of cardio-respiratory fitness for the prevention of diabetes in cohorts of men (Church, LaMonte, Barlow, & Blair, 2005), and both men and women (LaMonte, Blair, & Church, 2005). In New Zealand, fewer than one third of adults reported that they did not engage in the recommended level of activity (Elley et al., 2004; Hillary Commission, 1998; Sport and Recreation New Zealand, 2003). Activities varied with age, gender and ethnicity. Women were

less likely to exercise than men (Hillary Commission, 1998; Sport and Recreation New Zealand, 2003). Nearly half of the older adults ( $\geq 60$  years.) did not undertake any leisure-time physical activity. Analysis of the national survey data also showed that inactive but otherwise healthy adults – who are potentially at risk – are unlikely to get advice on physical activity from their general practitioners.

In summary, we know that being active and eating healthy is good for health but the question now becomes, “How do we make this happen?” The presence of policies and plans to promote physical activity at the local and national levels indicate that spaces and facilities for physical activity can have an important influence on physical activity (Kahn et al., 2002; Ministry of Health Clinical Trials Research Unit, 2009). However, for those living with T2DM, it is clear that to delay insulin resistance and to achieve, and maintain, good blood glucose control, it is necessary to achieve body weight reductions through increased frequency, intensity and duration of physical activities equal to, or more than, 30 min/day (Swinburn, Walter, Arroll, et al., 1998). Again, these are important aspects of glycaemic control (blood glucose control) at all stages of diabetes, even once treatment with oral medication or insulin has commenced. Along with regular physical activity, it is also believed that good nutrition also reduces the occurrence of T2DM (LaMonte et al., 2005; Simmons, Rush, & Crook, 2008).

### **2.2.2 Food security**

Healthy eating is a critical part of T2DM health care. It has beneficial effects on metabolic control and hypertension. Consumption of foods, both type and quantity, can determine healthy body size and prevalence of obesity. An expert consultation report on diet, nutrition and prevention of chronic diseases has set population food-based dietary recommendations (World Health Organisation, 2003). They recommended

consumption of a minimum of 400 g of fruits and vegetables per day by adults for the prevention of heart disease, diabetes, cancer and obesity. In 1997, the National Nutrition survey showed a mean vegetable and fruit intake of 420 g/day for men and 404 g/day for women (Tobias et al., 2006). Food security problems were also assessed. The definition of food security incorporates the availability of sufficient, healthy and safe foods, as well as the ability to access or acquire such foods (Parnell, Reid, Wilson, McKenzie, & Russell, 2001). Notably, females were more likely to experience food insecurity than males, while the elderly, although under-represented, showed they were the most food secure (Parnell et al., 2001). Furthermore, those living in households which were the least food secure had the highest body mass index (BMI), while those who were in households that were moderately food secure had a lower BMI, and those living in the most food secure households had the lowest of all (Parnell et al., 2001). Others have found that obesity rates are associated with deprivation in low income groups (Andrieu, Darmon, & Drewnowski, 2006). Several studies have shown that energy-dense foods, composed of refined grains, added sugars or fats, represent a low-cost and highly palatable option for the consumer; and lean meats, fish and fresh fruits and vegetables are considerably more expensive (Andrieu et al., 2006; Drewnowski & Specter, 2004). The latter would suggest that these households are poorer and have a lower fruit intake. These findings would then suggest that those living in households that are food insecure have poorer quality diets. However, from 1997 to 2008/09, there was a significant decrease in the proportion of Māori living in households that were fully, or almost, food secure. Moreover, there was also an increase in the proportion of Māori males who consumed two or more servings of fruit a day, but no change for Māori females and no change in the proportion of Māori males and females who

consumed three or more servings of vegetables a day over the same time period (Ministry of Health, 2012a).

### **2.2.3 Accumulation of excess body fat: definitions and measurements**

Obesity can be defined as a disease in which excess body fat has accumulated in places, such as the intra-abdominal or waist area, to the extent that health may be adversely affected (World Health Organisation, 2000). It is reportedly a global problem reaching epidemic proportions (Danaei et al., 2011; Malik, Willett, & Hu, 2013). Excess body fat located in the intra-abdominal area is strongly associated with T2DM and is precipitated by insufficient physical activity and food insecurity (Browning, Hsieh, & Ashwell, 2010; World Health Organisation, 2006).

The current statistics and guidelines (World Health Organisation & International Diabetes Federation, 2006) use the BMI, weight kg/height m<sup>2</sup>, to define degrees of obesity with the inclusion of waist circumference definitions, of abdominal obesity (Appendix A). Body ‘fatness’ and BMI are more associated across ethnic groups, than individuals (Rush, Freitas, & Plank, 2009). Further, it is also widely recognised that there are ethnic differences in body build and body composition that may affect the relationship between BMI and excess body fat (Hansen, Siersma, Beck-Nielsen, & de Fine Olivarius, 2013; Rush, Scragg, Schaaf, Juranovich, & Plank, 2009). In addition, there are a number of studies that have examined the relationship between accumulated body fat and BMI among ethnic groups (Rush, Crook, & Simmons, 2009; Rush, Freitas, et al., 2009). These researchers found that at a given BMI South Asians (Indian) had up to 10% more total body fat than Europeans. In contrast, Māori and Pacific Island groups had lower body fat at the same BMI as Europeans (Rush, Freitas, et al., 2009).

Obesity in Māori and Pacific Island people was defined as  $32 \text{ kg/m}^2$  or more using BMI (Ministry of Health, 2003). However, in 2008, the Ministry of Health decided to use the same World Health Organisation cut-off points ( $\text{BMI} \geq 30 \text{ kg/m}^2$ ) for New Zealanders (Ministry of Health, 2008). Furthermore, in a cross-sectional study that included European, Māori, Pacific Island and Asian Indians, adult body fat distribution, muscularity, bone mass and leg length were measured by dual energy X-ray absorptiometry (Rush, Freitas, et al., 2009). They showed ethnic differences in body build, body composition and fat distributions among these ethnic populations. For example, Asian Indians had more fat, both total and in the abdominal region, with lower lean mass, skeletal muscle and bone, than all other ethnic groups (Rush, Freitas, et al., 2009). Such findings suggesting universal BMI cut-off points may not be appropriate in comparing obesity prevalence between ethnic groups or setting weight targets for individuals.

Optimal waist circumference cut-off measures have also caused debate in the recognition of ethnic body composition and body mass differences (Rush, Crook, et al., 2009). It is widely agreed that waist circumference is a better measure of risk than the BMI because it is a measure of accumulated excess body fat in the abdominal regional (Rush, Crook, et al., 2009; Rush, Freitas, et al., 2009; R. W Taylor et al., 2010) and is strongly associated with T2DM (Ministry of Health Clinical Trials Research Unit, 2009; Nishida, Ko, & Kumanyika, 2009; World Health Organisation, 2000). In a sample of 3800 Māori who undertook a two-hour oral glucose tolerance test, optimal waist circumference and BMI criteria for T2DM risk were identified and were higher than the global criteria (Rush, Crook, et al., 2009). The waist cut-off for women was 98 cm and 103 cm for men, compared with the International Diabetes Federation measurements of 80 cm for women and 102 cm for men (Rush, Crook, et al., 2009).

In addition, it is also argued that the waist to height ratio (WHtR) may be a more sensitive screening tool to identify central adiposity than waist circumference; and the BMI, for detecting cardio metabolic risk factors. Associated risk factors can include obesity and T2DM in adults and children of many ethnic groups (Ashwell, Gunn, & Gibson, 2012; Browning et al., 2010). However, in Aotearoa New Zealand there is a dearth of reports concerning the use of WHtR measurements of accumulated excess body fat in adults, although it has been included in some recent reports for children (R. W Taylor et al., 2010; R. W. Taylor, Williams, Grant, Taylor, & Goulding, 2011). The combination of BMI and waist circumference, as screening measures, give a better reflection of body fat content and distribution and risk of metabolic disease that includes newly diagnosed T2DM.

#### **2.2.4 Obesity: prevalence trends in Aotearoa New Zealand**

Over the past 25 years the New Zealand population has shown an increase in the prevalence of overweight and obese people (Ministry of Health, 2002b, 2008, 2012b, 2012c). The 2008/09 New Zealand Adult Nutrition Survey analysis compared Māori and non-Māori by using the World Health Organisation world population age distribution (Ahmad, Boschi-Pinto & Lopez, et al. 2000). Forty-one per cent of Māori males and 48% of Māori females were found to be obese (Ministry of Health, 2012a). While the reported prevalence is age adjusted, Māori population longevity is, on average, seven years lower than New Zealand Europeans.

It is well documented that increased rates of accumulated excess body fat has driven the T2DM epidemic in New Zealand Māori (Joshy & Simmons, 2006; Ministry of Health, 2008, 2012a; Rush, Plank, Mitchelson, & Laulu, 2002; Simmons, 1996). These conditions are now informally referred to as the twin diseases. Central adiposity,

hyperglycaemia and hypertension are all associated positively with excess body fatness (Joshy & Simmons, 2006; Ministry of Health, 1999, 2008; Swinburn, Walter, Ricketts, et al., 1998). An alarming outcome of these co-morbidities is that, if untreated, the lifespan can be shortened by up to 15 years (Gillies et al., 2007; Ministry of Health, 2008). Furthermore, up to 75% of people diagnosed with T2DM will die from heart disease, high blood pressure or high cholesterol levels (Gillies et al., 2007; Joshy & Simmons, 2006; Simmons, 1996). This adds to the burden of disease and huge costs for health care.

In summary, the most commonly recognised factors associated with accumulated excess body fat across the life course are: a genetic predisposition (includes prenatal and postnatal factors) such as insufficient physical activity and food security (Ministry of Health, 2008; World Health Organisation, 2003, 2010). Excessive adiposity, especially of fat in the abdominal (waist) region, results when patterns of consumption of energy dense foods and high levels of inactivity persist for a long period of time (Drewnowski & Specter, 2004; Simmons, Thompson, & Volklander, 2001). However, for those with a genetic predisposition to live in an obesogenic environment, the rate of accumulated body fat and risk for T2DM may be higher than for other groups (Drewnowski & Specter, 2004; Zimmet & Thomas, 2003).

### **2.3 A life course approach for the epidemiology of Type 2 diabetes mellitus**

A growing body of evidence supports a life course approach for understanding the evolution, epidemiology and treatment of chronic diseases, in particular, T2DM (Ben-Shlomo, 2007; Ben-Shlomo & Kuh, 2002; Gillies et al., 2007). This approach involves examining the risks and impacts of physical, biological, geographical, behavioural and psychosocial influences during gestation, infancy, childhood, adolescence, young

adulthood and later life (Bandura & Locke, 2003; Ben-Shlomo, 2007; Ben-Shlomo & Kuh, 2002). Such an approach supports finding ways to understand and inform the treatment and prevention of chronic diseases through lifestyle interventions by those responsible for strategic decision-making in health policies. Moreover, a recent systematic review and meta-analysis of key international randomised controlled lifestyle intervention trials confirmed that physical activity and dietary change can prevent/delay the onset of T2DM for those with impaired glucose tolerance - a form of pre-diabetes (Baker, Simpson, Lloyd, Bauman, & Fiatarone Singh, 2011; Gillies et al., 2007). In Aotearoa New Zealand, studies have been conducted to assess the understanding of participants in the GRx health service; and why some individuals who were prescribed a GRx adhered to, or did not adhere to, the physical activity and nutritional food advice for those with medical conditions that would benefit from engaging in physical activity, such as cardio-vascular and Type 1, Type 2, or gestational diabetes mellitus diseases (Elley et al., 2004; Pringle, 2008). What was found was that the GRx health service is cost effective (Dalziel, Segal, & Elley, 2006; Elley et al., 2004) and increases physical activity and quality of life over a 12-month period (Elley, Kerse, Arroll, et al., 2003). There is little evidence to suggest that other GRx health services are more efficacious in promoting changes in physical activity or diet, but that a GRx programme could have lasting clinical benefits (Eaton & Menard, 1998). These authors estimated that approximately 10% of GRx patients increase physical activity to a point where they lowered the risk for all causes related to mortality compared with individuals who are inactive.

It is thought that qualitative research, combined with the social ecological model, is likely to be advantageous for investigating factors that can influence (e.g. intrapersonal, interpersonal, social/cultural, and physical environmental factors), interact and shape

physical activity and healthy eating behaviours (Adams & White, 2005; Fisher et al., 2005; Krebs, Bell, et al., 2013; Krebs, Parry-Strong, et al., 2013). In saying this, translating a life course approach is best represented in the delivery of lifestyle interventions underpinned by behavioural theories of change.

### **2.3.1 Lifestyle interventions: changing behaviours is complex**

Successful lifestyle interventions involve processes for changing behaviours, even though achieving behaviour change is complex. Successful lifestyle intervention involves integrating health promoting behaviour into the activities of daily life and environmental modification is often needed to support these changes. The environment includes physical, mental and social (including family) aspects. A number of behavioural theories are applied in lifestyle interventions to predict and/or explain observed lifestyle behaviours (e.g. patterns of physical activity and nutritional food choices). Key theories/models include the trans-theoretical model and stages of change constructs (Prochaska, 1996; Prochaska, Norcross, Fowler, Follick, & Abrams, 1992), as well as social cognitive theory and perceived self-efficacy (Bandura, 1977; Bandura & Locke, 2003). Both these theories underpin motivational interviewing techniques as a tool for behaviour change (Miller & Rollnick, 2012).

Most interventions incorporate aspects of health belief and trans-theoretical models of behavioural change. A key concept within the trans-theoretical model is that individuals who change behaviours move through the following stages of change; i) pre-contemplation: no intention to change behaviour; ii) contemplation: intention to change behaviour iii) preparation: preparing to change behaviour; iv) action: changed behaviour; and v) maintenance: sustained behaviour change. These stages do not occur in a linear fashion but, rather, the individual moves back and forth between stages before

progressing to the action and maintenance stages (Clark, Hampson, Avery, & Simpson, 2004; Prochaska, Norcross, et al., 1992). Lapses and relapses within the trans-theoretical model, are assumed to be part of the process of change. That is, ambivalence is integral in relation to the process of change while an individual balances the costs and barriers in performing a given behaviour. Associated research assesses the benefits of a particular behaviour, such as increased physical activity and healthy eating options (Prochaska, 1996; Prochaska & DiClemente, 1992; Prochaska, DiClemente, & Norcross, 1992; Prochaska, Norcross, et al., 1992). Furthermore, an integrated part of the application of the trans-theoretical model is self-efficacy theory that is underpinned by decreasing barriers to change and increasing self-efficacy (Bredahl & Roessler, 2011; Clark et al., 2004). Increasing self-efficacy allows the individual to gain confidence in making healthy decisions with the guidance of a significant other. The significant other in the GRx research study in this thesis is the health professional who works with the individual to strengthen motivation and readiness to change. Self-efficacy can also be termed as becoming more confident in a given task. Confidence is usually gained from an individual's actual ability to perform a set behaviour (Bandura, 1977; Bandura & Locke, 2003). Thus, behavioural change is facilitated by a personal sense of control. The belief to take action and to solve a problem is likely to empower and enable an individual to accept decision(s) (Bredahl & Roessler, 2011; Clark et al., 2004). Evidence of accepting decisions would include working with a health professional to set activity goals (e.g. walking 30 min/day per week and keeping a record of the distance walked). There is empirical evidence that when moving through the stages of change, motivational interviewing techniques administered by trained health professionals can play an integral part in assisting individuals to achieve their goals in lifestyle

interventions (Miller & Rollnick, 2009, 2012; Miller, Yahne, Moyers, Martinez, & Pirritano, 2004).

A key component of motivational interviewing is goal setting. Motivational interviewing techniques have been established in global (R.M. Anderson et al., 2009; Bandura & Locke, 2003; Barnett, 2004; Gillies et al., 2007) and local settings (Agban, Elley, Kenealy, & Robinson, 2008; Ellison-Loschmann & Pearce, 2006). Thus, health professionals work with individuals to set and achieve ideal outcomes. An example may include body weight reduction through increased frequency, intensity and duration of physical activities that are equal to, or more than, 30 min/day, coupled with increased and applied knowledge about reducing the intake of foods high in fat (including saturated fat and dietary fat), the proportion of total energy, energy density and the importance of fibre intake in daily activities (Swinburn, Walter, Arroll, et al., 1998). Mutual respect between the health professional and the participants is encouraged to enable and empower the participants to engage in, and adhere to, lifestyle interventions. It is recognised there is a paucity of literature about participant views in earlier lifestyle studies (Barbosa et al., 2011) even though some studies reported the importance of integrating participant views as part of the process of improving an intervention (Elley, Kerse, Arroll, et al., 2003; Patel et al., 2011; Pringle, 2008). Hence, there is the need to integrate participants' viewpoints as a means to improve and maintain healthful behaviours. An evaluative approach to lifestyle intervention content and processes addresses how well lifestyle interventions reach potential participants and, if not, then the question under assessment would be, "How come?" Strategies for the improvement of all health services should begin with an appreciation of recommended best practice and current practice approaches in the treatment of people newly diagnosed with T2DM. Such strategies would include the interaction and communication styles between the

participant, their primary health worker and those evaluating the strategy. There is an assumption that the health provider and their employees would, collectively, have the resources and skills to assess and prepare a management plan that encompasses an understanding of the participant's cultural, socio-economic and support networks, alongside their medical complaints (Ellison-Loschmann & Pearce, 2006; Gillies et al., 2007). This is not always achieved.

In addition, culture-centred and ethics publications have identified the importance of health professionals (and researchers) acknowledging cultural and socio-economic realities and the availability of support networks (Hudson et al., 2008, 2010; L. T. Smith, 1999, 2012). Although this concept is not new, it remains important for the health professional and researchers to assess their own worldviews (i.e. values, beliefs and attitudes) as a way of understanding and showing empathy to others (Hudson et al., 2008, 2010; L. T. Smith, 1999, 2012). The underlying principle is to ensure the perceptions and experiences of the participant are heard through open-ended inquiry and not misinterpreted by the potential biases of the health professional and/or researcher (Hudson et al., 2008, 2010; L. T. Smith, 1999, 2012). It is clear that the ability to respect values and belief systems among people can lead to the engagement in trust, tolerance and enhance the integrity of all involved (Hudson et al., 2008, 2010; L. T. Smith, 1999, 2012).

Five randomised controlled trials of intensive lifestyle interventions, both national and international, for those diagnosed with T2DM, are shown in Table 2.1. The first four lifestyle interventions focused on diabetes prevention, while the last is for those diagnosed with diabetes. In saying this, little is known about the long term impact of receiving a GRx programme, or the similarities and differences with respect to

understanding how individuals from different ethnic groups (e.g. Māori, New Zealand European and other ethnic groups) or different physical environments (e.g. rural and urban) account for their GRx responses.

Table 2.1

*Randomised controlled trials: physical activity and diet interventions*

Name of trial	Characteristics of participants	Mean BMI	Intervention	Outcomes
<i>International</i>				
Diabetes Prevention Program (DPP) – USA (Noordman, Koopmans, Korevaar, van der Weijden, & van Dulmen, 2013)	n=3234 primary care patients, men and women, mixed ethnic backgrounds, various ages	34	Control Metformin Intensive lifestyle modification	58% relative risk reduction in T2DM 50% of lifestyle group met 7% weight loss goal and 74% exercised at least 150 At final visit, 38% maintained their target weight and, 58% met their exercise goal
The Finnish Diabetes Prevention Study (DPS) – Finland (Lindstrom et al., 2003)	n=522 (166 men and 341 women)	31	Control Intensive lifestyle modification	58% relative risk reduction in T2DM incidence 86% participants in treatment group met their exercise goal and, 25% met their fibre requirement Intensive lifestyle modification reduced the incidence of diabetes by 58%
Da Quing IGT and Diabetes Study (DQS) – China (Pan et al., 1997)	n=577 primary care patients men and women aged >25 yr	25.8	Control Diet Exercise Diet and exercise	38% relative risk reduction T2DM incidence. Exercise significantly higher in exercise intervention group, but not significant
<i>New Zealand</i>				
Te Wai o Rona: DPS (Simmons et al., 2008)	n=3,817 eligible Māori aged ≥ 28 yr	33	Cluster controlled Intensive lifestyle Diet & physical activity	Vanguard study – overall weight loss 5.2 (6.6) kg (p<0.01) among those with IGT/IFG
Green prescription (GRx)	n=451 participants	30	GP practice Control Physical Activity	Improvement in blood pressure due to increased physical activity

### **2.3.2 The Green prescription (GRx) health service**

In Aotearoa New Zealand, the national GRx programme (aka Te Rongoā Kākāriki) is a health service adapted from a similar British programme (F. Jones, Harris, Waller, & Coggins, 2005). The objective of the GRx is to increase physical activity and consumption of nutritious food among patients living with potentially physically-limiting medical conditions (e.g. diabetes, heart disease and obesity). General practitioners and/or practice nurses refer these patients to regional sports trusts to receive telephone advice/support on ways to increase physical activity and the consumption of nutritional food from the GRx team members. The GRx health professionals (facilitators) are trained in motivational interviewing skills (Miller & Rollnick, 2009, 2012; Miller et al., 2004). A key feature is that the facilitators work cooperatively with the patients to set personal goals associated with increasing physical activity and healthy eating. In general, fewer Māori have participated in national physical activity programmes and the associated research than non-Māori (Hillary Commission, 1998; Murphy, McAuley, Bell, & McLay, 2003; Simmons & Voyle, 2003; Voyle & Simmons, 1996), and the GRx health service is no exception (Pringle, 2008; van Aalst & Daly, 2004). Thus, developing models to effectively implement such programmes among Māori is a challenge. The inclusion of group activities and programmes has been used in an attempt to increase Māori participation (uptake). Sources of this information include the Hillary Commission (1998) and organisations such as Kahui Tautoko Ltd in Wellington, in 2005; Te Roopu Mānaaki, in 2006, and the 133 programme(s) that involve physical activity for Māori (Agencies for Nutrition, 2009). To the best of the researcher's knowledge none of these organisations appear to have a formal evaluation concerned with the efficacy (e.g. reduction in risk factors) or motivation to participate in these GRx programmes. Clearly, there is a need for

research to fill this knowledge gap. The GRx process includes a health professional (e.g. general practitioner or practice nurse) prescribing the level of physical activity that their patient can safely do. This information is referred to a kaiwhakahaere (facilitator) within the SPARC regional provider network (GRx teams). The role of the kaiwhakahaere (facilitator) is to contact the referred patient by telephone. Each kaiwhakahaere (facilitator) provides support and encouragement to motivate patients with advice on the options available in the patient's community to enhance their engagement in physical activity and to encourage them to eat nutritious food. Telephone contact is provided once a month, usually over the next three-month period. An evaluation of the GRx programme showed that telephone delivery of the GRx programme was associated with enhanced physical activity uptake among New Zealand Europeans (Carr, 2001; Elley et al., 2004; Elley, Kerse, & Arroll, 2003; Kerse et al., 2005; Murphy et al., 2003).

A number of modified GRx programmes are offered by regional providers (Sports Trusts) in New Zealand (e.g. Waitakere, Manukau City and Christchurch) in partnership with Sport and Recreation New Zealand. The common factor is the referral process, whereas the differences include group activities, method of goal setting, nutritional food workshops and physical fitness, as opposed to individual or telephone support. Given the paucity of formal evaluations associated with the GRx health service, there is a need for research to fill this knowledge gap.

### **2.3.3 The New Zealand Diabetes Prevention Strategy – Te Wai o Rona**

In 2001, the Ministry of Health and New Zealand Health Research Council released a request for proposals for NZ \$1.35 million over three years for the prevention of T2DM. There were no successful applicants and the request for proposal was re-released in

2002. The proposal required: i) demonstration of a significant reduction in incidence of T2DM over 3+ years; ii) an intervention costing no more than \$200 per person; and iii) inclusion of a control group (did not receive one-on-one coaching) and a target of high risk individuals. The successful response to this request was from a partnership of researchers, funders, health services and Māori in the Waikato and southern region of the Lakes District Health Board areas. The study was known as Te Wai o Rona: Diabetes Prevention Strategy (TWOR: DPS); a randomised cluster controlled trial to prevent/reduce new cases of T2DM by 35% through lifestyle changes (Simmons et al., 2008). Te Wai o Rona: Diabetes Prevention Strategy commenced in 2004 and included: i) one-on-one coaching by Māori Community Health Worker (MCHW); ii) a tailored GRx approach for those at higher risk of cardiac events, which is described in more detail elsewhere (Simmons et al., 2008); and iii) community action to promote local groups to support physical activity and healthy eating choices. The randomised cluster controlled trial was registered with the Australian and New Zealand Clinical Trials Registry in 2005 (ACTRN012605000622606). A key outcome stated by the researchers was that this randomised cluster controlled trial was to put diabetes prevention services in places crucial for Māori and for Aotearoa New Zealand, when, and if, the randomised cluster controlled trial was successful (Rush, Crook, & Simmons, 2008; Simmons et al., 2008). One important component of Te Wai o Rona: diabetes prevention strategy was the referral of those with newly diagnosed diabetes, or at risk from cardiovascular disease, for a GRx assessment with a kanohi-ki-te-kanohi (face-to-face) intervention. This component was evaluated separately: key findings generated recommendations for how engagement with Māori could improve their participation in national adult GRx programmes. This randomised cluster controlled trial was not continued after three years for funding reasons (Simmons & Rush, 2010). The next section will provide a

review of the main findings of the in-depth interviews in the face-to-face GRx programme offered to participants in Te Wai o Rona: Diabetes Prevention Strategy, as employed by the researcher.

#### **2.3.4 Preliminary/scoping work**

A review of the main findings of the in-depth interviews of potential participants in the kanohi-ki-te-kanohi (face-to-face) GRx programme offered to participants in Te Wai o Rona: diabetes prevention strategy found to have new diabetes on screening, will be shared in the next section. A total of 690 participants in the Te Wai o Rona Diabetes Prevention Strategy were found to have new diabetes (n=161), impaired fasting glucose (n=115) or impaired glucose tolerance (n=414), and were recommended to receive and/or administer GRx referrals from their general practitioner. The general practitioner was recommended to refer the individual to a kaiwhakahaere (facilitator). In general, if a participant was referred by a general practitioner for a GRx they were seen by the Sport Waikato kaiwhakahaere (facilitator), although there were some caveats to this. Only 5% of participants with impaired fasting glucose/impaired glucose tolerance, and 34% of those with new diabetes, were referred for a GRx (n=81). Fewer than 5% of those referred actually undertook the GRx programme even though this health service was free, the intervention kanohi-ki-te-kanohi (face-to-face) and the referral process had been streamlined. Given the small percentage of referrals, even when the administrative processes and out of pocket expense costs had been removed, suggested that such an approach had a minimal effect in regard to improving the uptake of physical activity. In-depth interviews of a total of 60 participants and key informants revealed five key themes: i) the kaupapa (purpose) of Te Wai o Rona Diabetes Prevention Strategy was important; ii) few participants were aware of the national GRx programme; iii) kanohi-ki-te-kanohi (face-to-face) was important to Māori; iv) Māori Community Health

Workers credibility was important in the community; and v) whakawhānaungatanga (strengthening of network ties) was helpful in establishing and maintaining the uptake of physical activity. Furthermore the informants stated that the inclusion of Māori cultural principles and ethics were likely to be helpful in establishing and maintaining the uptake of physical activity among Māori. The evaluation generated a recommendation for a review of the referral processes for GRx and a randomised controlled trial of the kanohi-ki-te-kanohi (face-to-face) approach versus the waea (telephone) approach among Māori to see if this could increase their responsiveness to the safe uptake of, or participation in, physical activity. In addition, given that it was unclear why general practitioners did not refer participants for a GRx, further research would be required to find ways to increase the referral rate for those likely to benefit. There was also some suggestion for those with heart conditions that physical activity may need caution, but this was the purpose of the GRx process.

Similarly, Pringle (2008) found that Māori preferred a kanohi-ki-te-kanohi (face-to-face) approach, rather than the standard GRx telephone approach, as it was perceived to be more personal and helpful. He also supported the preference for health professionals to incorporate Māori values and/or traditions in group settings, when sharing information about health, nutrition and physical activity or activities. An understanding of concepts about wider concerns associated with: income inequality, the cost of nutritional food (e.g. fish and fruit), access to sport or physical activities (e.g. travel or joining fees), education, and racist attitudes, were reported as beneficial for increasing all practice patients' participation and active participation in the GRx programme. Inclusion of these concepts would expect to result in a consideration to practise a holistic approach. Again, such an approach is aligned with the kaupapa Māori philosophy. One can then argue the necessity of investigating the differences between the standard GRx waea

(telephone) intervention and a kanohi-ki-te-kanohi alternative, and how such an alternative would benefit Māori in regard to increasing their uptake of a prescription for physical activity. A further factor for investigation is to identify what the impact of a longer intervention time period has on physical activity choices. That is, measuring how helpful the kanohi-ki-te-kanohi (face-to-face) mode of delivery is in commencing and maintaining the new physical activity levels. As well as motivation and methods for delivery of the GRx health service, there are external barriers to participation in physical activity and healthy eating which need to be understood better. Active participation with the prescribed treatment is important and, while the mode of delivery is the focus of the present GRx research study, barriers in the food and physical activity environment, including access, geographic isolation, availability of nutritional food and cost (Wang et al., 2009), will be noted if such barriers are reported.

In summary, from the literature review and the Te Wai o Rona: DPS pilot research (publication in preparation), it was identified that it may take longer than three months to achieve increased participation in physical activity, the consumption of nutritional food as well as a reduction in the risk factors. It was perceived by Māori health scholars that there is an issue of lack of trust and understanding by Māori, which prevents their participation in the GRx programme and other mainstream health services (Cram, Smith, & Johnstone, 2003; Pringle, 2008). Kaupapa Māori health research and bicultural principles have been advocated for researchers to work collaboratively with potential Māori participants in a health research project (Hudson et al., 2008, 2010; Kerr, Penney, Moewaka-Barnes, & McCreanor, 2010; L. T. Smith, 1999). Māori health scholars have identified that one way of potentially increasing Māori participation is through kanohi-ki-te-kanohi (face-to-face) contact to establish trust and rapport (Hudson et al., 2008, 2010; L. T. Smith, 1999, 2012). Furthermore, it was presumed that the inclusion of a

kanohi-ki-te-kanohi (face-to-face) mode of delivery in the GRx health service may also help New Zealand European participants to increase their daily dose of physical activity and the consumption of nutritional food, and this could be measured by comparing the kanohi-ki-te-kanohi (face-to-face) approach with the national existing waea (telephone) GRx health service between Māori and New Zealand Europeans. Therefore, this GRx research study is about comparing the impacts of a waea (telephone) versus a kanohi-ki-te-kanohi (face-to-face) mode of delivery to participants within the administration of the GRx health service for Māori and New Zealand Europeans.

#### **2.3.5 Research aims**

This literature review has led to the formulation of the following research aims to be assessed during this doctoral thesis

The first research aim involved an examination of the differences in the engagement and active participation (adherence) by using kanohi-ki-te-kanohi (face-to-face) rather than waea (telephone) interactions between the health professionals and the participants in the delivery of the modified GRx health service over six and 12 months. Participation of Māori in research and engagement with the intervention for this GRx research study will be compared with previous studies, and then the kanohi-ki-te-kanohi (face-to-face) and waea (telephone) modes of delivery will be compared to show whether the kanohi-ki-te-kanohi (face-to-face) results in greater engagement and active participation rates at each time point (baseline, six months and 12 months) than waea (telephone).

The second research aim involved assessing the overall effectiveness of the GRx health programme in: i) physical; and ii) metabolic changes at six and 12 months for Māori and New Zealand European adult women and men in the present GRx research study. It is proposed that the kanohi-ki-te-kanohi (face-to-face) mode of delivery would present

with greater positive outcome trends in both physical and metabolic changes than the waea (telephone) mode of delivery. The immediate effects would also be assessed at six months and sustainability assessed by measures at 12 months, again, with the presumption that the physical and metabolic outcome measures compared within the present GRx research study will also be compared with other studies.

The third research aim was to better understand the association between changes in participant levels of physical activity and their perceptions of intent, attitude and empowerment at each time point in this GR research study and to compare these results with other studies.

A fourth research aim involved a qualitative understanding of how participants make and maintain lifestyle changes through participating in the GRx health service.

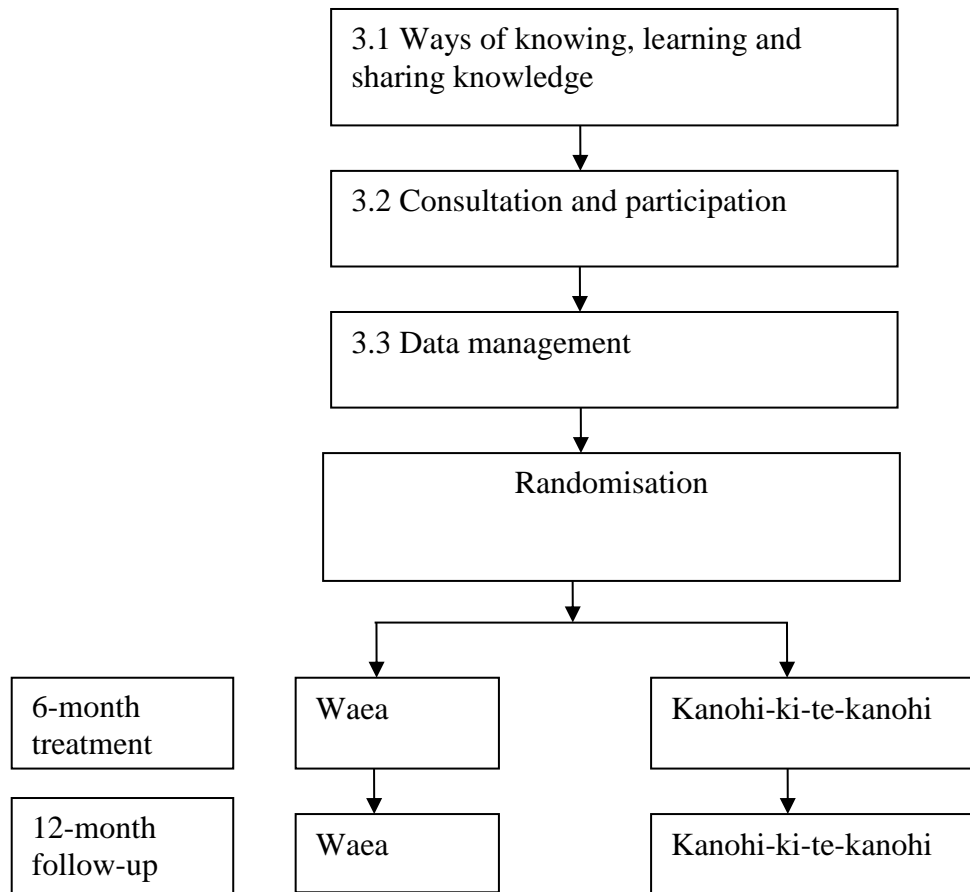
Understanding participants' changes in perception about physical and/or metabolic measures will be compared with each delivery mode, waea (telephone) or kanohi-ki-te-kanohi (face-to-face), and between Māori and New Zealand European.

A qualitative approach of inquiry will also provide reasons for why the inclusion of kaupapa Māori methodological approach may increase recruitment and engagement of Māori (and New Zealand European) in the (modified) GRx health service. Furthermore, benefits and barriers (i.e. attitudes, behaviours and motivational factors) in participation, effectiveness and sustainability will be explored from the participants', Māori GRx kaiwhakahaere (facilitator) and general practitioners' viewpoints.

In the next chapter the kaupapa Māori methodology, the randomised trial research design and research questions will be answered and also the role of ways of knowing in the context to this body of work will be described.

## Chapter 3 **Methods and study design**

This chapter provides the background for the kaupapa Māori methodological approach, general method processes and data collection sources, as identified in Figure 3.1 and Table 3.1.



*Figure 3.1.* Methods and study design of the randomised trial

Table 3.1

*Data collection types and time points*

Data types	Baseline	6 months	12 months
Physical	√	√	√
Metabolic (GP and medical laboratory data)	√	√	√
Questionnaires – interviewee administered	√	√	√
Interviews and case study	√	√	√

### 3.1 Research methods: ways of knowing, learning and sharing

The first aim and question was to identify whether the kanohi-ki-te-kanohi (face-to-face) approach improved recruitment, engagement and active participation (adherence) more so than delivery by waea (telephone) for Māori and New Zealand European. This question was underpinned by the application of kaupapa Māori research principles and frameworks (Came, 2013; Hudson et al., 2008, 2010; L. T. Smith, 2012). Therefore, understanding how to engage and retain Māori (and New Zealand European) to actively participate in the GRx health service was a priority. Lifestyle interventions have been shown to be successful and include sustainable ways of reaching participants (recruitment), improving engagement and increasing adherence to physical activity and the consumption of nutritious food (Elley et al., 2004; Simmons et al., 2008). The first section will cover the ways of knowing, ways of learning and ways of sharing knowledge as a means of translating information into action.

#### 3.1.1 Ways of knowing

Traditionally, mainstream research models, or ways of knowing, have not always benefitted indigenous peoples, including Māori (Bishop, 1994; Hudson et al., 2010; L. T. Smith, 1999, 2012). The information collected was led by researchers who, primarily, perpetuated colonial values; while the true complexities of Māori values, belief systems

and customs were often not reported accurately (Bishop, 1994; Bishop & Glynn, 1999). Limiting misinterpretation of responses should focus on who determines and implements the research aims and/or questions (Bishop, 1994; Bishop & Glynn, 1999; Hudson et al., 2008, 2010; L. T. Smith, 1999, 2012; Walker & Amoamo, 1987). The key research questions should be associated with how recruitment of volunteers/participants will occur (L. T. Smith, 1999, 2012; Walker & Amoamo, 1987); how the data will be interpreted; how information will be disseminated; and who will own and/or gain from the information (Bishop & Glynn, 1999; Hudson et al., 2008, 2010; L. T. Smith, 1999, 2012; Walker & Amoamo, 1987). Māori, historically, have endured considerable pressure to assimilate with non-Māori society, but have continued to maintain their own identity (M. H. Durie, 1998a; Hudson et al., 2008, 2010; Orange, 1987; Walker & Amoamo, 1987). Retention of such an identity is generally referred to, in traditional Māori life, as the recognition of optimum Hauora (health and well-being) and it is holistic, requiring balancing the various constructs of the whānau (family) with the physical environment. These constructs include customs such as tangi (funeral processes), practices such as whaikorero (speeches relevant to the occasion) and, most significantly, the marae complex (ancestral meeting house and surrounding area) where many of the customs and practices occur (Hudson et al., 2008, 2010; Mead, 2003; Walker & Amoamo, 1987). Also important are the values and beliefs associated with whakapapa (geneology), whānaungātanga (family relationships), awhinatanga (support) and wairuatanga (spirituality) practices (M. H. Durie, 1998a, 1998b, 2001; Hudson et al., 2008, 2010; Mead, 2003; Walker & Amoamo, 1987). Bishop and Glynn (1999) and Smith (1999; 2012) have indicated that the researcher working with Māori might benefit from becoming familiar with Māori culture, in general. Familiarity with Māori customs, practices, values and beliefs of whānau and whenua (environment/land) are regarded as

an important way to develop trust, to share information, to develop strategies, to receive and to give relevant advice, to build networks and to create ideas with Māori in research (Came, 2013; Hudson et al., 2008, 2010; L. T. Smith, 1999, 2012).

Since the 1960s, in Aotearoa New Zealand, there has clearly been a shift in the way non-indigenous researchers and academics have positioned themselves and their work in relation to Māori research issues (Bishop & Glynn, 1999; M. H. Durie, 2003, 1998b; Hudson et al., 2008, 2010; L. T. Smith, 1999, 2012). An important starting point includes bicultural strategies developed between Māori and non-Māori. These research strategies are unique to Aotearoa New Zealand because they are an active response from the government/crown towards the Treaty of Waitangi. It is about the honouring of the Treaty through the acknowledgement and application of the principles - partnership, participation and protection (M. H. Durie, 1989, 1998a; Hudson et al., 2008, 2010; Orange, 1987). Evans and Paewai (1999) provided definitions of each principle as follows:

- a) *Partnership*. Māori and non-Māori are all citizens of New Zealand; Māori are also afforded tangata whenua (people of the land) status and, as such, might identify with a whānau (extended family), hapu (sub-tribe), or iwi (tribal group).
- b) *Protection*. This applies to the principle of self-determination and rights to traditional properties or taonga (treasures), such as culture, land, language and all that is deemed important, including self-determination in matters affecting personal well-being, such as health, welfare, educational policies and legislation.
- c) *Participation*. The recognition that Māori, as individuals and equal partners, should be afforded equal access and participation in society's benefits.

These principles provide a framework for identifying Māori ethical and practice issues in terms of the rights, roles and responsibilities for researchers and Māori communities in New Zealand. Other models, introduced by Graham Smith, extend the bicultural research framework and have also been accepted and applied by non-indigenous researchers when researching with Māori (Came, 2013; G. H. Smith, 2001; Wyeth, Derrett, Hokowhitu, Hall, & Langley, 2010). These models are:

1. “*Tiaki model*. (Mentor model). Authorative Māori people guide, sponsor and/or mediate the research process
2. *Whangai model*. (Adoption model). The ‘whangai’ researchers are incorporated into the daily life of Māori people, and maintain a connection beyond the research project
3. *Power sharing model*. Community assistance is sought by the researcher so that a research enterprise can be developed in a meaningful way.
4. *Empowering outcomes model*. Research is designed to provide accurate information as to what Māori want to know and what has beneficial outcomes for Māori, or the group researched.”

Incorporating the above four research models and Treaty principles into research designs ensures that the research team is able to think more seriously about effective and ethical ways of answering research questions with, and among, Māori people. The key role of bicultural strategies and/or models is to foster equality, equity and inclusiveness among the researcher, research team, organisation(s) and participants. Furthermore, researchers who identify as Māori (who attain and maintain Māori cultural beliefs and values and integrate mainstream research ways of knowing) are more likely

to be accepted by Māori and invited to participate in an investigation that concerns Māori (Came, 2013; Pitama et al., 2011; L. T. Smith, 1999, 2012). Although kaupapa Māori research principles may reflect, in general, the way Māori behave, it is important to note that not all Māori follow the same values or principles (M. H. Durie, 1998a, 1998b). Durie (1998) pointed out that being Māori may, or may not, carry the same implications for everyone because diverse realities exist for Māori and/or New Zealand Europeans, such as socio-economic status, geographical location, and political and sexual orientation (M. H. Durie, 1998a, 1998b). Cultural identity of Māori is linked as much to contemporary realities as to traditional arrangements (M. H. Durie, 2001).

Some researchers have developed ways of working with Māori on a variety of studies in ongoing and mutually beneficial ways (Hudson et al., 2008, 2010; L. T. Smith, 1999, 2012; Walker & Amoamo, 1987). According to these authors, the ways of investigating a research question stem from the wider struggle of Māori people for self-determination and are referred to as kaupapa Māori principles. Examples of kaupapa Māori principles include that the investigation: (i) is related to being Māori; (ii) is connected to Māori philosophy and principles; (iii) takes for granted the validity and legitimacy of Māori, the importance of Māori language, knowledge and culture; and (iv) is concerned with the struggle for autonomy over one's own cultural well-being (Hudson et al., 2008, 2010; L. T. Smith, 1999, 2012). Kaupapa Māori (Māori philosophy, world-view and cultural principles) is also variously referred to in the literature as kaupapa, kaupapa Māori praxis, or kaupapa Māori theory. Essentially, the core of kaupapa Māori is the catch cry 'to be Māori is the norm' where the research approach is for/with/by Māori and it does not exclude or reject mainstream or other indigenous cultures (Came, 2013; G. H. Smith, 2001; L. T. Smith, 1999, 2012).

### 3.1.2 Ways of learning

From a researcher's perspective, the use of whānau responsibility and/or principles is more likely to promote participation and, possibly, increase success of Māori in health outcomes. Historically, knowledge related to Māori has generally been passed on by koeke/kaumatua (elders) to future generations in narrative form (oral literature). Such forms include: waiata (song), moteatea (poetry), pakiwaitara (story) and kauwhau (moralistic tale) (Mead, 2003; Metge, 1990; G. H. Smith, 2001; L. T. Smith, 1999, 2012). Whakapapa (genealogy) and associated raranga korero (folktale) were affirmed as methods of attaining and giving accurate information from a teacher to young person in a classroom setting (Bishop & Glynn, 1999). Imparting knowledge in this manner highlights repetition and the active practice of skills, tasks and/or activities within the traditions of Māori. Tangaere (1997) stated "this is known in Te Kohanga Reo and Kura Kaupapa Māori as Te Aho Marua', the philosophical body of knowledge which binds Māori to ancestors, the land, the universe, and Io Matua Kore (God)" (p.48). Essentially, intricate interrelationships between people and the universe permeate ahuatanga Māori (relationships) based on tikanga Māori (Māori traditions, values and customs) of the iwi (Māori people). Te Reo Māori (Māori language) is usually the vehicle that enables transmission of these traditions. One may argue that by using cooperative and/or collective variables associated with Māori traditions in learning, it is likely that an individual will socialise, attain and/or maintain the acquisition of new tasks, skills, or activities successfully within the Māori context, for use in a non-Māori context.

The dynamics of Māori usually infer whānau (family) or groups compete, while individuals co-operate within the whānau (extended families). Such dynamics emphasize the sense of inclusiveness where people usually feel part of a whānau

(family), hapu (sub-tribe) or iwi (tribes/people) or the group (Cram et al., 2003; Mane, 2009; D. R. Thomas, 1995). In contrast, some researchers report that mainstream (New Zealand European) perspectives have a bias towards autonomy rather than towards affiliation and a sense of community within a group (M. H. Durie, 2003). A bias towards personal adaptation and functioning to be successful and/or self-sufficient versus the overall collective well-being is often termed as self-contained individualism (Sampson, 1977, 1985). Fundamentally, the collaborative and collective methods of learning associated with Māori traditions, values and customs would be useful within learning environments for Māori (G. H. Smith, 2001; L. T. Smith, 1999, 2012). The use of kaupapa Māori research concepts may also be helpful for those living with chronic health diseases, such as T2DM, in acquiring knowledge and understanding and then engaging in activities around health and well-being. For the individual, newly diagnosed with T2DM, managing their blood glucose concentration through increased physical activity and consumption of nutritious food is a priority. The following are concepts often associated with kaupapa Māori styles of learning that encompass collecting and sharing information with individuals actively involved in education and/or research projects (Bishop & Glynn, 1999):

- Tino rangatiratanga (relative autonomy/self-determination of Māori culture)
- Taonga tuku iho (cultural aspirations) – the *treasures from the ancestors*, includes the cultural aspirations Māori hold for their children, and messages that guide our/their relationships and interaction patterns.
- Ako (reciprocal learning) literally meaning *to teach and to learn* – the teacher or health professional does not have to be the fountain of all knowledge
- Kia piki ake i nga raruraru o te kainga (mediation of socio-economic and home difficulties)
- Whānau primary concept (a cultural preference) that contains both values (cultural aspirations) and social processes (cultural practices)

- Kaupapa, the collective vision principle.

The six above-mentioned concepts suggest that some changes in a learning environment may be conducive and effective in promoting the acquisition of knowledge. In this study the acquisition of knowledge focuses on hauora (health and well-being) for Māori and New Zealand European through physical activity and nutritional lifestyle changes. Tino rangatiratanga infers that when one participates on one's own terms then this will bring a commitment to participate and learn (Mane, 2009), while the concept *ako* promotes reciprocal learning (Pere, 1994). Ako means to learn as well as to teach in the context of both individual learners or within a group. A probable advantage of reciprocal learning is the obvious opportunity to share information that is relevant to the experience and/or culture of the participant, researcher or health professional. *Kia piki ake in nga raruraru o te kainga* is about including families in the activities. Again, an inference is made about collective responsibility through the concept *taonga tuku iho*, which is about valuing the traditions of tupuna (ancestors) in guiding the relationships associated with the health and well-being of the self through the belief that such values and practices will be available and accessible for future generations.

### 3.1.3 Ways of sharing knowledge

From a researcher's perspective the use of whānau responsibility and/or principles is more likely to promote participation and, possibly, increase success of Māori in health outcomes. When research involves the views of individuals, there is always a subjective element, which limits generalisations yet adds depth and understanding. An essential feature of health research is about the translation into practice and the understanding of what is able to happen compared with what should happen (e.g. we know that being active and eating nutritious food is good for health but how to make this happen is more complex). The focus of mixed methods or ways of knowing allows

a focus on the aims and research question(s) around a human problem, rather than a particular research paradigm, to understand complex health behaviours (R. B. Johnson & Onwuegbuzie, 2004; L. T. Smith, 1999, 2012). To achieve this understanding of the research aims and questions requires the collection of information through multiple sources, strategies, approaches and methods. One of many examples of how information is shared between individuals and groups is the tuakana (older sibling same gender)/teina (younger sibling same gender) model. This model is often described as a Māori human development model; and it derives from two principles: whānaungātanga (embracing relationships) and ako (acquire or learn about information).

Whānaungātanga is about strengthening kinship ties of a whānau (family) or group, underpinned by the commitment of aroha (love and respect) and manaakitanga (nurturing relationships or looking after people). The survival of the group (e.g. whānau) is then often based on what the group (e.g. whānau), collectively, sees as important (Hudson et al., 2008, 2010; Mead, 2003; Pere, 1994; L. T. Smith, 1999, 2012). Pere (1994) also adds that loyalty, obligation, commitment and an inbuilt support system are important values with regard to establishing the whānau as a strong stable unit, within the hapu and, consequently, the tribe. The mana (prestige or integrity) of the collective is upheld through the act of inviting, sharing and/or giving learned experiences. A further model, tuakana/teina (scaffolding), also includes the principle ako (to learn), where the roles of tuakana and teina are often reversed (Tangaere, 1997). The design symbolises how acquisition, or sharing of knowledge, may occur. The steps ascending upwards describe Tane-nui-a-rangi's (Māori God of the sky) ascent to gain, or share knowledge, and the challenges he faced during his journey. The main point of the tuakana/teina (scaffolding) is that the individual will learn and share knowledge with others, and in the process s/he will be faced with challenges. However, through

continuous practise and perseverance s/he may become more competent in intellectual and behavioural pursuits, such as, an improved health status by managing blood glucose concentrations.

In addition, it is important to provide a space that is comfortable for Māori employees or researchers accepting contracts from non-Māori and within mainstream agencies that involve Māori concerns (Mahuika, 2008; L. T. Smith, 1999, 2012). Such a space would enable Māori researchers to meet and discuss issues with other Māori researchers, mentors or support groups while employed by a mainstream agency (Mahuika, 2008; L. T. Smith, 1999, 2012). Alternately, Māori researchers can share positive experiences as a means to feel included and to reduce opportunities for misinterpretation of Māori perspectives (L. T. Smith, 1999, 2012). Furthermore, Māori research ethics guidelines and academic bodies in health (e.g. New Zealand Health Research Council and Nga Pae o te Maramatanga) have been formed to assist Māori researchers, particularly those working within health, by sharing information about best practice in research with indigenous people, in particular, Māori (Hudson et al., 2008, 2010; Mane, 2009). These environments also allow for the dissemination of research or topical discussions relating to kaupapa Māori research.

In summary, researchers who intend to collect information from, and share the stories of, Māori should always keep three questions in mind. First, is the research relevant and worthwhile for the people participating in the research? Second, who is the researcher accountable to, specifically, in regard to support networks being in place for the researched? Third, will those being researched gain knowledge that is of benefit to them? The researcher should also recognise and understand that not all Māori are the same in terms of the degree to which they identify as Māori and Te Ao Māori (world view of

Māori). The goal of such questions is to help reduce the exploitation of those participating in research projects and to also reduce misinterpretations of what is truly being expressed by those who have been invited to participate in the research process. Māori methods advocate equal sharing of power and control through the processes of reciprocity and feedback as a partnership principle. Moreover, Māori are generally considered to have a cultural dynamic that is more collective and/or co-operative (M. H. Durie, 1998b; Hudson et al., 2008, 2010; L. T. Smith, 1999, 2012; Walker & Amoamo, 1987). For this research, the learning and sharing of knowledge is about increasing physical activity and nutritional food choices options within the GRx modes of delivery (waea/telephone and kanohi-ki-te-kanohi) to improve the Hauora (health and well-being) of each participant.

The principles of kaupapa Māori research were used to design, implement and evaluate the two GRx modes of delivery styles: waea (telephone) and kanohi-ki-te-kanohi (face-to-face). This was established from the outset through maintaining established working relationships (consultations) with the Te Wai o Rona: Diabetes Prevention Strategy Kaitiaki (guardians). An advisory group was formed to: i) oversee the running of this GRx research study (Appendix B); ii) to provide opportunities for, and to establish, working relationships that would reach potential participants; and iii) to develop a GRx working manual (Appendix C) to be adopted by Sport Waikato. Regular contact was facilitated between the researcher and the research advisory group (i.e. weekly, fortnightly and monthly) in a number of ways (i.e. face-to-face, email and/or Skype). Meetings occurred monthly with the advisory group (primarily in the planning stages of the research), while weekly contact or meetings continued with academic supervisors and Sport Waikato colleagues. Aside from kanohi-ki-te-kanohi (face-to-face) meetings, other modes were used, such as Skype (video or audio calls), emails and telephone

conversations. In-house training for systolic and diastolic blood pressures and resting heart rate as well as physical measurements was provided by Professor Elaine Rush (PhD, Professor of Nutrition) prior to collecting baseline measures. The Māori GRx kaiwahakahaere (facilitator) was trained to ensure that the way of collecting and recording physiological/physical measures was standardised and could be replicated by other GRx team members.

At the conclusion of this research a summary report (online and hardcopy) will be disseminated to all key parties involved, with the full thesis being available through the AUT library or from the author. Context and location details about Sport Waikato Regional Sports Trust, who were responsible for the delivery of the GRx programme, will follow in the next section.

#### **3.1.4 Sport Waikato Regional Sports Trust, location and context**

The focus of Sport New Zealand Regional Sports Trusts (RST) is on increasing regional levels of physical activity and strengthening sport and physical recreation. There are 17 RST located in Aotearoa New Zealand, each of which has a close working relationship with their local territorial authorities (for example, regional and district councils), iwi authorities and district health boards. This research project was centred in the Waikato and delivered by Sport Waikato RST. Waikato is a region spanning 21,220 km<sup>2</sup> that includes one metropolitan city and 10 small rural and semi-rural towns and ranges from the Coromandel to Turangi and Waihi to Kawhia (Statistics New Zealand, 2006). This region has an approximate population of 382,000 and a median personal income of \$24,000 (Statistics New Zealand, 2006). Sport Waikato and the Waikato DHB have an established working relationship to provide physical activity and healthy eating projects in the Waikato. In 2006, the census indicated that the Waikato DHB had a higher

percentage of the population being Māori (21%) compared to the national average of 15%, and more were older (e.g. 65+ yr) (Statistics New Zealand, 2006). Consequently, the Waikato DHB has a strong commitment to reduce the current and, potentially, high deprivation rates by including and engaging Māori in health service decision making, and to deliver health information and health services in a culturally appropriate way (Waikato District Health Board, 2012).

Since 1998, the Sport Waikato RST has been contracted by Sport New Zealand to deliver the GRx health service in the Waikato region. There are two components of the GRx health service; adult and child; the child component is known as Active Families, but is not considered here. Prior to the start of this GRx research study, the usual procedure at Sport Waikato when receiving a referral to the adult GRx was to provide telephone support once a month for three months for each referral. Each person referred was delegated a facilitator (patient support person) who had received four hours of training in how to apply motivational interview techniques, to give advice on what the GRx health service was about and, in particular, how physical activity and nutritional food choices can be improved. These motivational support sessions usually ranged from 15 - 30 min (personal communication, Stephanie McLennan, GRx coordinator).

The next sections will describe the design of the GRx research study and the inclusion and exclusion criteria.

## **3.2 Data management**

### **3.2.1 Design of randomised trial: power calculations**

The overarching purpose of this randomised trial was to assess what GRx mode of delivery resulted in greater participation and adherence and whether the inclusion of kaupapa Māori research ‘ways of knowing, learning and sharing knowledge’ might

increase Māori (and New Zealand European) recruitment and adherence to the GRx lifestyle intervention. A second purpose was to assess what GRx mode of delivery waea (telephone) or kanohi-ki-te-kanohi (face-to-face) resulted in greater body weight (mass) and waist circumference loss over six and 12 months, in comparison with retrospective clinical results from the GP.

Sixty-four participants, per subgroup of intervention and ethnicity, were regarded to be sufficient to demonstrate a two-sided mean weight difference of 4 kg (assuming a standard deviation of 8 kg: power = 80% significance level  $< 0.05$ ) between the two GRx modes of delivery waea (telephone) or kanohi-ki-te-kanohi (face-to-face) and by ethnicity. Seventy potential participants would be allocated to each of the four groups to allow for 10% drop-out. Hence, the initial intent was to recruit 280 adults (aged 18 years and over). With a total of 140 potential participants in the kanohi-ki-te-kanohi (face-to-face) intervention group and 140 in the waea (telephone) intervention control group the GRx research study, with a power of 80% and significance  $P < 0.05$ , would allow detection of a 10% increase in the uptake rate of physical activity, assuming a 5% uptake in the control group and a 15% uptake in the intervention group.

Furthermore, the benefits and barriers (i.e. attitudes, behaviours and motivational factors) in participation, effectiveness and sustainability were also explored. A summary of the tools used to assess qualitative and quantitative measures is shown in Table 3.2. In-depth details about the schedules will be presented in the chapters where administered.

Table 3.2

*Measures at baseline, six months and 12 months*

Measure	Specific Measure	Reference
<i>Chapter 4.</i> Recruitment, participation and retention Demographic (baseline only)	Number  Age Gender Ethnicity	
<i>Chapter 5.</i> Biological/Physical	*Body weight *Waist circumference *Height Arterial blood pressure & resting heart rate	Wedderburn electronic scale Measuring tape Stadiometer  *Derived measures – BMI and waist-height ratio
GP and Pathlab	Glycated haemoglobin Lipids including triglycerides	Clinical records
<i>Chapter 6.</i> New Zealand Physical Activity Questionnaire (NZPAQ)	Time spent being physically active	Sport & Recreation New Zealand, 2008
The Physical Exercise intent	Predict behavioural intentions to being physically active	Stanford Patient Education Research Centre, 2008
The Diabetes Attitude Survey (DAS-3)	General measure of diabetes related attitudes	Anderson, Fitzgerald, Funnell, & Gruppen, 1998
The Diabetes Empowerment Scale – Short Form (DES-SF)	General measure of self-efficacy –related to engaging in physical activity	Diabetes Research Training Centre, 2000; 2003
<i>Chapter 7.</i> Face-to-face interviews	Measure of participant views about GRx	Williams, 2005
Ministry of Health quarterly reports	GRx kaiwhakahaere views	Williams, 2008
GP evaluation letter	Measure of GP views about GRx	Williams, 2008
Kaiwhakahaere = facilitator		

### 3.2.2 Analysis: Quantitative

All physical measurements were recorded on paper then transferred into an Excel <sup>TM</sup> spreadsheet as soon as possible after data collection. Data entered was rechecked for transcription errors against the original documents by the researcher. Limits were set for each continuous variable (e.g. height 140-220 cm) to avoid errors resulting from incorrect measurements (see Appendix N). For each Likert scale question from the New Zealand Physical Activity Questionnaire Physical Activity Questionnaire (NZPAQ), the Diabetes Attitude Survey (DAS), the Diabetes Empowerment Scale – Short Form (DES-SF) Questionnaire and the interview schedule, responses were coded and entered as ordinal variables (score factors). Clinical information, obtained through the general practitioners and those from Pathlab Waikato Limited, were also entered into an Excel <sup>TM</sup> spreadsheet.

Table 3.3

*Reference range for quantitative determination of glucose control, cholesterol and/or lipid concentration in human serum, plasma, urine or cerebrospinal fluid*

Assay	Gender	Age	Reference range	Units
Cholesterol	All	All	<5	mmol/L
Triglyceride	All	All	<2	mmol/L
HDLC	All	All	>1.0	mmol/L
TC/HDL-C ratio	All	All	<4.5	
HbA1c	All	All	<5	%

HDLC = High density lipoprotein cholesterol; TC/HDL-C ratio = Total cholesterol/High density lipoprotein – Cholesterol ratio; HbA1c = glycated haemoglobin.

The information collected requested included measures for: i) blood glucose control such as HbA1c and fasting glucose; ii) arterial blood pressure such as systolic and diastolic blood pressure and resting heart rate; iii) lipid levels such as total cholesterol

ratio, high density lipoprotein (HDL) and triglycerides; iv) weight; and v) medications, as prescribed in the general practitioner's practice.

### **3.2.3 Analysis: Qualitative**

Interpretation of the information collected was driven by a general inductive approach (D.R Thomas, 2006). The value of this approach is that it can produce trustworthy and meaningful findings by following a systematic set of procedures (Kerse et al., 2004). This analysis style of the interview records was an iterative and reflective process undertaken by the researcher, the specific details of which are reported in Chapter 7.

### **3.2.4 Ethics**

Ethical approval was provided by two ethics committees (the Northern Y Regional Committee and Auckland University of Technology's Ethics Committee). Ethics approval initially included the cover letter, panui (information sheet) and consent forms (Appendix O). This was followed by additional consent forms to allow access to the participating laboratory and general practitioner records and for public media exposure (Appendix P-Q). All participants were given a unique identification code in order to retain confidentiality of their personal details online and in hardcopies. Hard copies were stored in a lockable filing cabinet and on secure data systems managed by Sport Waikato RST. This randomised trial was registered with the Australian New Zealand Clinical Trials Registry, Request number 335024-UTN: U1111-1113-5419.

## Chapter 4 **Recruitment, engagement and active participation**

In this chapter, the engagement and active participation (adherence) rates for the traditional approach of waea (telephone) versus the newer approach of kanohi-ki-te-kanohi (face-to-face) in the delivery of the Green prescription (GRx) health service for newly diagnosed T2DM patients were investigated.

### **4.1 Introduction**

Overall, in Aotearoa New Zealand, a relatively low (< 16%) percentage of Māori diagnosed with medical conditions participate in the national GRx health service (Kahui Tautoko Ltd, 2005; van Aalst & Daly, 2004). In the Waikato area, there are three European adults for every Māori, aged 45 to 64 years, with the prevalence of T2DM in Māori being twice that of New Zealand European (Ministry of Health, 2008). The expectation, therefore, would be that for every three New Zealand European adults prescribed a GRx programme there would be two Māori prescriptions. Why the GRx health service is not reaching Māori, or why Māori do not engage or adhere to the GRx health service, is not well understood.

A key predictor of successful engagement and active participation of people with T2DM in such programmes is that the health professional is perceived to be knowledgeable about methods to improve health outcomes (Pringle, 2008; van Aalst & Daly, 2004). Moreover, for successful interaction, health professionals and researchers need to be empathetic towards the Māori worldview (i.e. values, beliefs and attitudes) particularly in relation to health and well-being (Came, 2013; M.H. Durie, 1994; L. T. Smith, 1999, 2012; Sue, 1998). Intimately related to empathy and improvement of engagement of Māori participants in a health service, is a requirement that trust, tolerance and integrity be exhibited by the health professional (Eketone, 2008; Hudson et al., 2008, 2010).

Such attributes of the health professional have been shown to improve health outcomes (Hudson et al., 2008, 2010; B. Jones, Ingham, Cram, Dean, & Davies, 2013; Simmons et al., 2008; L. T. Smith, 1999, 2012).

A recent review of the GRx health service in Aotearoa New Zealand has highlighted that Māori have two important preferences relating to mode of delivery (Pringle, 2008). First, a kanohi-ki-te-kanohi (face-to-face) mode of delivery is preferred over the traditional waea (telephone) mode for the delivery of a health service. Second, health professionals or mentors (e.g. Māori GRx kaiwhakahaere - facilitator) who either identify as Māori, or support Māori culture, are preferred. An understanding of the effectiveness of these preferences may lead to better engagement and long term health outcomes.

The overall aim of the work presented in this chapter was to examine the differences in the engagement and active participation of participants by using kanohi-ki-te-kanohi (face-to-face) in comparison to waea (telephone) interactions between the health professionals and the participants in the delivery of the health service. The two main aims were, first, to determine whether a kanohi-ki-te-kanohi (face-to-face) approach would result in greater engagement (more Māori registered than before) when used to introduce the health service and, second, when used to deliver the GRx health service via the Māori GRx kaiwhakahaere (facilitator), would result in greater rates of active participation (adherence) using in the kanohi-ki-te-kanohi (face-to-face) approach rather than the traditional waea (telephone) approach.

## **4.2 Methods**

The randomised trial of the GRx health service consisted of two treatments (waea/telephone and kanohi-ki-te-kanohi/face-to-face), two ethnic groups (Māori and

New Zealand European) and two gender groups (women and men). Measurements at baseline, six months post intervention and at the 12-month follow up time points were examined. For the detailed design of the randomised trial and methods of measurement see Chapter 3. Ethical approval was provided by both the Northern Y Regional Committee (Appendix O) and the Auckland University of Technology's Ethics Committee. This randomised trial was registered with the Australian New Zealand Clinical Trials Registry, Request number 335024-UTN: U1111-1113-5419.

#### 4.2.1 **Recruitment processes**

Following consultation with GP practices in the Waikato area participants were recruited by the practices over a 14-month period. Recruitment involved communication with primary care providers (i.e. general practitioners/practice nurses) who initially diagnosed and assessed the suitability of the participants for referral into the GRx health service delivered by Sport Waikato. The sequence of the events in the overall recruitment process to the randomised trial was as follows:

1. Referral: First, a GP or practice nurse prescribed a GRx for a patient newly diagnosed with T2DM and informed him/her about the opportunity to take part in the GRx research study. If the patient indicated that they were interested in the GRx research study they were referred to Sport Waikato using a modified script. Information from the Diabetes research GRx referral form (Appendix E) was then entered electronically into the Sport Waikato database.
2. Eligibility: At Sport Waikato the eligibility criteria for the GRx research study (a new diagnosis of T2DM together with Māori or New Zealand European ethnicity) were evaluated. Potential participants were not invited to take part in the GRx research study if they had received any insulin therapy in the previous

12 months, received dialysis treatment, or had ambulatory problems, or other diseases that would prevent them participating in physical activity. They were also not invited if they were already regularly engaging in more than two and half hours of moderate intensity of physical activity each week.

3. GRx management: Next, the Māori GRx kaiwhakahaere (facilitator) received the GRx referral form of eligible participants. These were delivered to the GRx administrator responsible for entering the details into the GRx research participant database. This administrator then sent the researcher the contact details of each potential participant.
4. Organising first contact: The researcher telephoned potential participants to introduce the research study and also to make an appointment to meet them to discuss it further in a setting of their choice (e.g. home, Sport Waikato, workplace, or marae). If there was no telephone contact with the potential participant, the researcher posted them a letter of introduction together and information sheet.
5. First meeting/introduction: At the first meeting (i.e. introduction of the programme), which was kanohi-ki-te-kanohi (face-to-face), the researcher explained the research study and provided a written information sheet and consent form. If the potential participant agreed to participate and signed the consent form, the researcher administered the baseline questionnaires and made physical measurements of their height, weight, waist circumference and blood pressure. The participant was informed that the researcher would visit again in six months when the GRx health service delivery was completed and again at 12 months to evaluate the progress made.

The GRx administrator then randomly assigned the participants to receive either waea (telephone) or kanohi-ki-te-kanohi (face-to-face) approaches for the treatment. The randomisation schema was a preset algorithm and included stratification by ethnicity and gender. The Māori GRx kaiwhakahaere (facilitator) then made contact to initiate the GRx treatment allocated.

#### **4.2.2 Delivery of the GRx programme**

A single Māori GRx kaiwhakahaere (facilitator) was employed by Sport Waikato to deliver the diabetes research GRx programme. Two Māori GRx kaiwhakahaere were employed over the recruitment and delivery process of 20 months. Both Māori GRx kaiwhakahaere had tertiary degrees in sport and leisure and received training for motivational interviewing and other requirements of GRx service delivery at Sport Waikato. The delivery involved a session of one-on-one intensive support once each month for each participant over six months (rather than the national 3-month GRx programme) regardless of delivery mode. The first session was an introductory session to prepare an individualised exercise programme and give advice about healthy food consumption. The exercise programme included repetitive movements to enable the participant to walk, swim or do weight training. These movements were aimed at strengthening potentially weakened muscle groups. An outcome was to improve the participants overall health and their participation in activities of daily life (e.g. walking, washing clothes, vacuuming, or gardening). At the conclusion of all contact sessions the time and place for follow-up meetings were confirmed. The Māori GRx kaiwhakahaere (facilitator) used motivational interviewing techniques (Miller & Rollnick, 2009) in the delivery of the programme (see Chapter 3 for details). Each participant set achievable goals for increasing physical activity and to consume healthier foods for the next month. The physical activity goals were usually walking, swimming

or physically active home based activities (e.g. using bake bean cans as weights, vacuuming the house and tasks involved with washing and hanging out clothes). If agreed, homework was set which, in turn, involved the completion of a diary of physical activities. Interaction time with the GRx kaiwhakahaere (facilitator) ranged from 15 to 60 min. Kanohi-ki-te-kanohi (face-to-face) sessions, in general, took longer than waea (telephone) sessions and required travel time from Sport Waikato to the participant's home for the kaiwhakahaere (facilitator). However, a differentiating factor in the kanohi-ki-te-kanohi (face-to-face) delivery mode was that the Māori GRx kaiwhakahaere (facilitator) was able to respond to both visual and touch (sensitivity and thoughtfulness) cues from the participant. Cues are addressed further in Chapter 7.

#### 4.2.3 Statistical Analysis

The presence, or absence, of interactions with participants was evaluated at three time points - baseline, six months and 12 months. Participants' active participation in the GRx research study was defined as interaction with the researcher. Data are presented as frequency and percentages for active participation at each measurement point and grouped by treatment, ethnicity and gender to examine for differences in the trends of active participation. The magnitude of any differences between groups was determined by calculation of the 95% confidence interval (CI) of the percentage meeting the criteria within a group and an inspection of the overlap of CI between groups. The 95% CI for each group were determined from the probability equation based on the normal distribution curve. An Excel<sup>TM</sup> spreadsheet was used to calculate this data, being  $\pm$  width of the confidence interval =  $1.96 * \text{square root of the percentage response} * (100 - \text{percentage response}) / \text{number in the group}$ . For example, if 93/162 met the criteria that is, 61%. Following the formula above, the width of the CI either side of the percentage is 7.5%, or the rounded CI for 61% is between 54 and 69%. The interval depended on

the total number in each group and the number who met the criteria. While an overlap of the 95% CIs indicated the findings for the group were not statistically significant (meaningful), although the difference may still be clinically meaningful for an individual.

## **4.3 Results**

### **4.3.1 Recruitment**

Figure 4.1 outlines the overall sequence for recruitment and participation in this GRx research study. The recruitment phase occurred over 18 months from 13<sup>th</sup> August 2008 to 15<sup>th</sup> February 2010. During this time, 1755 referrals for the GRx were received by Sport Waikato and entered into the Sport Waikato GRx database. Of the total referrals, only 12% met the eligibility criteria for this GRx research study, i.e. 210 participants. Of these, a further 27.6% (n=58) potential participants were excluded either because their contact details were invalid (n=22), they did not meet the criteria due to human error at first point of contact (n=22), or the recipient declined/withdrew and/or did not attend arranged interviews to obtain informed consent (n=14). This left a total of 152 participants recruited at baseline for the main GRx research study. Overall, there were twice as many women as men, i.e. 96 versus 56 participants, respectively, and 68 Māori versus 70 New Zealand European participants, agreed to participate in the GRx research study. Fourteen of these 152 participants accepted into this GRx research study were neither Māori nor New Zealand European (hence, labelled as 'Other'). This was a consequence of mistaken information recorded on the GRx referral forms and then later identified at the informed consent interview with the researcher. It was decided it would be better for community involvement in future research programmes if these 'Other' participants were not excluded from the GRx research study. The 'Other' group included participants of Cook Island Māori (n=12), Indian (n=1) or Filipino (n=1)

ethnicity. Hence, the total number of participants who were either Māori or New Zealand European was 138.

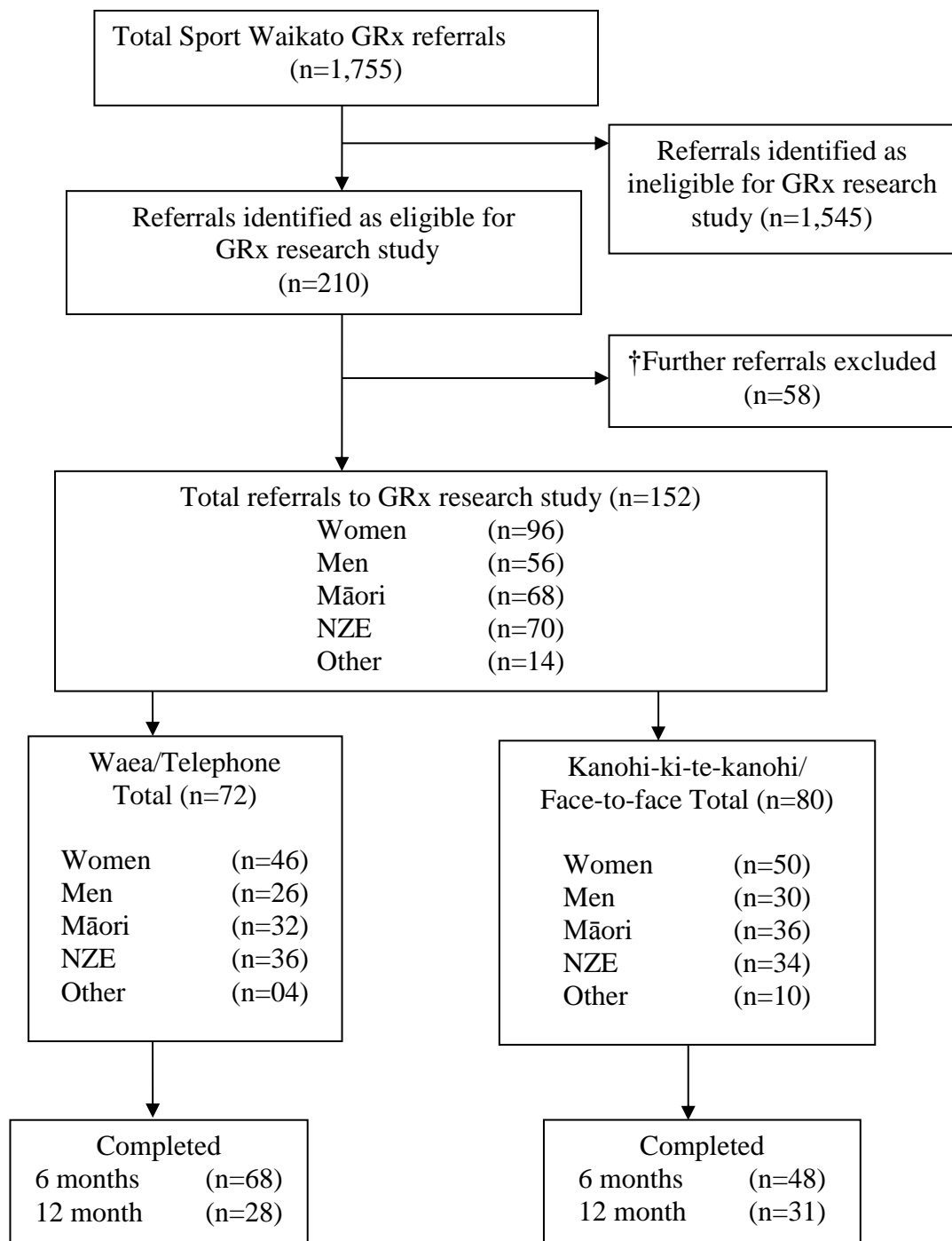


Figure 4.1. Referrals for GRx, eligibility for GRx research study, allocation to treatment and retention in the study

GRx = Green prescription; NZE = New Zealand European; ‘Other’ included due to referral patterns-see text

†Criteria were either Māori or New Zealand European and there was not a need to exclude any Māori or New Zealand European as recruitment rates were equivalent

†Not newly diagnosed T2DM or Māori or New Zealand European ethnicity identified.

#### 4.3.2 Delivery phase and assessment interviews

The two modes of delivery were, by design, intended to have similar numbers of participants by ethnic group (Tables 4.1 and 4.2) and gender (Table 4.2) at baseline. Of the 152 participants who consented and were interviewed at baseline, 14 participants did not start the GRx treatment this included; 10 Māori, three New Zealand European and one 'Other'; and they were not contacted again. It was also known that two Māori had relocated out of the Sport Waikato area for whanau (family) reasons.

Participant retention and, by definition active participation, at the 6-month and 12-month time points, was determined from their attendance at an interview with the researcher. Overall, there were a number of participants unable to be contacted by the researcher ~40% at six months and ~60% at 12 months (Table 4.1). Differences of retention by ethnic group were apparent at six and 12 months. There were 20-25% fewer Māori participants retained in the research study compared with New Zealand European at the 6-month and 12-month time points, respectively. Ten participants (four Māori, four New Zealand European and two 'Other' interviewed at six months) were not available for the final interaction with the kaiwhakahaere. Table 4.2 shows the sub-categories for all the participants. There was an apparent 10% greater retention for the kanohi-ki-te-kanohi than the waea mode of delivery after six months but this difference disappeared after 12 months (Table 4.1- 4.3). Gender differences indicated a marginally higher retention for women than men at six months and 12 months (Table 4.1).

Table 4.1

*Number and percentages of participants at each time point in the research study by ethnicity, mode of delivery and gender*

Group	Time point	(n)	(%)	95% CI
<b>All</b>	Baseline	152		
	6 months	93	61.2	(53.4, 68.9)
	12 months	61	40.1	(32.3, 47.9)
<b>Ethnicity</b>				
Māori	Baseline	68		
	6 months	35	51.5	(39.6, 63.3)
	12 months	20	29.4	(18.6, 40.2)
NZE	Baseline	70		
	6 months	53	75.7	(64.0, 84.5)
	12 months	39	55.7	(44.1, 67.4)
<b>Mode of delivery</b>				
Waea	Baseline	68		
	6 months	40	58.8	(47.1, 70.5)
	12 months	28	41.2	(29.5, 52.9)
KKTK	Baseline	70		
	6 months	48	68.6	(57.7, 79.4)
	12 months	31	44.3	(32.6, 55.9)
<b>Gender</b>				
Women	Baseline	96		
	6 months	61	63.5	(51.4, 75.6)
	12 months	41	47.7	(32.4, 63.0)
Men	Baseline	56		
	6 months	32	57.1	(40.0, 74.3)
	12 months	20	35.7	(14.7, 56.7)

Data are presented as (%) per cent of participants; CI, Confidence levels expressed as (lower bound and upper bound); n, number of participants; NZE = New Zealand European; waea = telephone; KKTK = kanohi-ki-te-kanohi/face-to-face; seven participants were measured at 12 months who were not assessed at six months

Table 4.2

*Number of participants assessed at baseline and attended meetings at six months and 12 months in relation to mode of delivery, ethnicity and gender*

	Waea			Kanohe-ki-te-kanohe		
	Māori	NZE	Other	Māori	NZE	Other
<b>Baseline (n=152)</b>						
Women	19	24	3	20	23	7
Men	13	12	1	16	11	3
Total	32	36	4	36	34	10
<b>6 months (n=93)</b>						
Women	10	19	0	10	19	3
Men	4	7	0	11	8	2
Total	14	26	0	21	27	5
<b>12 months (n=68)</b>						
Women	4	15	0	6	15	1
Men	3	6	0	7	3	1
Total	7	21	0	13	18	2

Data are presented as; n, number of participants; NZE = New Zealand European; mode of delivery = waea (telephone); kanohe-ki-te-kanohe (face-to-face); of the 68 participants at 12 months seven participants had not been measured at six months

Table 4.3

*Number and percentages of Māori and New Zealand European participants at each time point in the research study by mode of delivery*

Group	Time point	(n)	(%)	95% CI
<b>Māori</b>				
Waea	Baseline	32		
	6 months	14	43.8	(17.8, 69.8)
	12 months	7	21.9	(-8.7, 52.4)
KKTK	Baseline	36		
	6 months	21	58.3	(32.5, 75.1)
	12 months	13	36.1	(10.0, 62.2)
<b>NZE</b>				
Waea	Baseline	36		
	6 months	26	72.2	(55.0, 89.4)
	12 months	21	58.3	(37.2, 79.4)
KKTK	Baseline	34		
	6 months	27	79.4	(64.1, 94.7)
	12 months	18	52.9	(29.8, 76.0)

Data are presented as (%) per cent of participants and CI, Confidence levels expressed as (lower bound and upper bound) and, n, number of participants; NZE = New Zealand European; KKTK = kanohi-ki-te-kanohi/face-to-face

Four elements were identified for the drop-out rates at any point after baseline interviews. This included 11 participants who at baseline interview were found not to meet the eligibility criteria, two who provided invalid contact details, 14 participants who declined/withdrew due to hospitalisation, surgery, work commitments and/or family commitments and 25 who had a change of contact details or location (17 Māori, seven New Zealand European, one 'Other').

#### 4.4 Discussion

For the first time it has been shown that, prior to randomisation, all participants as part of the informed consent process received an initial kanohi-ki-te-kanohi (face-to-face)

meeting with the Māori researcher to explain the research process. And, therefore, the benefit of the service to the participant, is that as many Māori as New Zealand European signed up to receive the GRx health service and to participate in the research process. Secondly, after sign-up the attrition rate (drop-out) of Māori and New Zealand European was moderate at six months, with 65% of people still remaining. That is, 35% dropped out and were unavailable to be interviewed at six months. Sixty per cent of these participants were interviewed at 12 months (Table 4.1). At six months and 12 months the drop-out rate was 20-25% greater for Māori than New Zealand European. At 12 months one half of the New Zealand Europeans were available for interview and one third of Māori were available for interview. There was also a trend for greater adherence in the kanohi-ki-te-kanohi group but this did not reach statistical significance. For Māori, the main explanation for lack of participation in the service and follow-up at 12 months was transience: one in four (17/68) Māori did not complete compared to one in ten (7/10) New Zealand European because they had physically moved. Each of these findings is discussed below, in the context of the existing literature.

“All New Zealanders should have access to fair opportunities to participate in physical activity regardless of gender, age, race, socio-economic status, ability or geographic location.” (Hillary Commission – now SPARC; 1998, p.22)

A key concern identified in previous national GRx health service surveys was the paucity (<4%) of Māori participants (van Aalst & Daly, 2003, 2004; van Aalst, Kazakov, & McLean, 2003). In the present study the research design required that equal numbers of Māori and New Zealand European were engaged in both the research process (informed consent) and the GRx health service. This was achieved (Tables 4.1 and 4.2).

In the delivery of New Zealand public health services the researchers and health professionals are encouraged to work in partnership with community groups (i.e. whanau/family, hapu/sub-tribe and iwi/tribe – wider community) (Hudson et al., 2010; Israel, Schulz, Parker, & Becker, 2001; Simmons et al., 2008; L. T. Smith, 2012), and be responsive to the needs of individuals requiring assistance to improve their health and well-being (Israel, Schulz, et al., 2001; T. G. Pavey, N. Anokye, et al., 2011). It was presumed that the individual must also find the experience personally meaningful (Israel, Lichtenstein, et al., 2001; Israel, Schulz, et al., 2001; Pavey, Greitemeyer, & Sparks, 2011), which meant that the individual must have "the capacity to obtain, process and understand basic health information and services in order to make informed and appropriate health decisions" (Priston & New Zealand Ministry of Health, 2010). This capacity, health literacy, was the basis of informed consent and was a feature of the kaupapa (foundation) of this research. The researcher took time to explain to each participant why the GRx may benefit his or her health and management of T2DM. This understanding arose from the researcher's participation in a large community-based research and health service programme that preceded and informed this body of work.

This earlier programme was known as Te Wai o Rona: Diabetes Prevention Strategy (Simmons et al., 2008). In this programme the inclusion of a kanohi-ki-te-kanohi (face-to-face) approach by community health workers was used to gain informed consent. This programme signed up and engaged almost 20% of the Waikato Māori population aged 28 years and over (Simmons et al., 2008). This work, and the present GRx research study, showed that acceptance and knowledge of the potential participants' beliefs and values (Hudson et al., 2008, 2010; Israel, Schulz, et al., 2001; Simmons et al., 2008; Simmons & Voyle, 2003) by the health professional and researchers resulted in the short-term active participation, i.e. sign up. Thus, in this research process the

application of a kaupapa Māori research model; an understanding of bicultural frameworks and kanohi-ki-te-kanohi (face-to-face) interactions also appeared to maximise the recruitment and engagement of Māori.

After the initial interview, all participants were able to be contacted by the Māori GRx kaiwhakahaere (facilitator) and the same information about the health service was communicated, which further reinforced knowledge of the importance of, and how to improve, physical activity and nutrition. It suggested that the inclusion of kaupapa Māori and bicultural principles merit further investigation as a way to increase engagement and participation of Māori and New Zealand European with the GRx health service. A greater understanding of Māori perceptions associated with engagement and participation in the GRx health service was necessary, with the long term goal to increase physical activity and improve their nutrition (M. Johnson & Wood, 2013; Pringle, 2008) .

Attrition (drop-out) in this research study was moderate, with one third not presenting at the end of the six month intervention. A meta-analysis of eleven randomised controlled trials (Hawthorne, Robles, Cannings-John, & Edwards, 2008), in which a range of ethnic groups participated, identified that in 10 of the 11 randomised controlled trials the attrition rate at six months and 12 months was lower than 20%. The main reasons were the patients moved residence and communication was lost (10% withdrew). The reason for the greater attrition rates in the present research study, particularly at six months, was that the participants had withdrawn from the programme or communication was lost. Transient participants could only be contacted by letter, or if they had returned to their original address, or possibly through their GP (Aikaterini, Andrew, & David, 2013; van Aalst & Daly, 2003). Transience has been noted as a reason for

attrition in national GRx health service surveys and adds to the cost of health service delivery locally (M. Johnson & Wood, 2013; van Aalst & Daly, 2003; van Aalst & Daly, 2006).

An evaluation that compared processes, cost and outcome evaluations of two GRx modes of delivery (community support and telephone support) in the Auckland region, showed that there was a large drop-out rate (68%) between GRx referral and registration (Foley, Maddison, Jones, Brown, & Davys, 2011). However, Foley's evaluation did not provide reasons for the large rate of drop-out. Moreover, these authors reported that Māori and Pacific peoples engaged more readily in the community support (i.e. group face-to-face support). The strength of their study was the provision of choice at recruitment for the participant of either community or telephone support (Foley et al., 2011). These findings are aligned with the participants' views in the present GRx research study and will be discussed in more detail in Chapter 7.

Sustained participation, the inverse of attrition, was better for New Zealand European than Māori at 12 months, with one half of New Zealand Europeans available for interview compared to one third of Māori. It was expected that there would be fewer participants available at 12 months, compared to six months, because monthly interactions and support for the participant were removed. In a New Zealand cluster randomised controlled trial that assessed effectiveness of the GRx programme over 12 months (78% New Zealand European), the follow-up rate at 12 months was 85% for those enrolled (Elley, Kerse, Arroll, et al., 2003). However, Māori participation in this trial was not recorded. In another randomised controlled trial for women only (17% Māori and Pacific Island), the overall retention rate was 93% (Lawton et al., 2008). Lawton and colleagues did not report the retention of the Māori and Pacific Island

participants or retention by socioeconomic status. A recent systematic review indicated that the levels of adherence to exercise referral schemes, similar to the national GRx health service, were highly variable (T. G. Pavey, A. H. Taylor, et al., 2011). However, these authors reported that for five randomised controlled trials engagement or attendance at an initial consultation of the intervention was 80% (95% CI, 61% to 98 %), while adherence was 37% (95% CI, 20% to 54 %). Adherence in these randomised controlled trials was determined by the completion of a set number of sessions in an intervention, either numerically (e.g. six sessions intervention) or as a percentage. They also identified that there was insufficient information on the exercise referral process for appraisal of its contribution to the low adherence rate (Garrett et al., 2011; T. G. Pavey, N. Anokye, et al., 2011). The qualitative reasons for low adherence rates provided by the participants in the present GRx research study will be discussed in more detail in Chapter 7.

There was also a trend for greater adherence in the kanohi-ki-te-kanohi (face-to-face) group (Table 4.2). Systematic reviews of physical activity interventions in primary care and the community (Garrett et al., 2011; T. G. Pavey, N. Anokye, et al., 2011) have reported that the waea (telephone) advice sessions about physical activity and nutrition were more cost-effective, possibly because the population group was largely New Zealand European. Furthermore, a qualitative study (Pringle, 2008) of adults referred to a GRx health service in Hamilton and Nelson reported that with the kanohi-ki-te-kanohi (face-to-face) approach more Māori were engaged in the GRx health service than previously. However, these studies did not systematically compare the two delivery modes, waea (telephone) and kanohi-ki-te-kanohi (face-to-face), as assessed in the present GRx research study. One key reason for the present GRx research study was to find ways to increase participation in this GRx health service. The addition of a kanohi-

ki-te-kanohi (face-to-face) interview at the start of the service may increase participation in other settings, and should be explored further.

#### **4.4.1 Strengths and limitations**

It was surprising that over the 18 month time period of the present GRx research study only 210 people newly diagnosed with T2DM agreed to be referred to the GRx service and hence approached to take part in the research. It is unknown how many new cases were diagnosed, how many were actually offered the service or how many declined. Furthermore, one quarter of those who agreed to receive more information about the research did not participate, mainly because they could not be contacted. High transience, particularly for Māori, is a barrier to health services and longitudinal research (Baxter, 2002; Lillis, Simmons, Swan, & Haar, 2008). As a consequence, the present GRx research study was, ultimately, underpowered to detect statistical significant differences across the modes of delivery, ethnicity and gender. However, a key and novel difference between this research study and other studies is that it was designed to compare the overall process of delivering a health service, by waea (telephone) or kanohi-ki-te-kanohi (face-to-face), and how the different delivery mode impacted on Māori and New Zealand European participation. The present GRx research study's findings indicated a favourable trend at six months for kanohi-ki-te-kanohi (face-to-face) interactions in maintaining greater participation than waea (telephone). It was, therefore, assumed that this information could be used to power future studies.

This investigation was influenced from the outset by the use of a kanohi-ki-te-kanohi (face-to-face) interaction with the researcher to gain informed consent of the participants to take part in the present GRx research study. A full explanation was

included so the participants knew that they would meet with the researcher again at six months and why the GRx may benefit their health. While the kanohi-ki-te-kanohi (face-to-face) approach was an important process for enhancing the recruitment and engagement of Māori there was no evidence that the approach impeded, or enhanced, the engagement of New Zealand European.

#### **4.4.2 Future research work**

It is recommended that all Regional Sports Trusts should continue to build the capacities of their staff to be culturally responsive and respectful to their participants. In the present GRx research study, a kaupapa Māori approach was promoted by including kanohi-ki-te-kanohi (face-to-face) interaction at the first point of contact with the researcher to explain the GRx health services and then the two modes of delivery (waea/telephone and kanohi-ki-te-kanohi/face-to-face) were compared. The inclusion of one kanohi-ki-te-kanohi (face-to-face) interaction at the beginning of the health service could improve engagement and would cost less than all interactions being kanohi-ki-te-kanohi (face-to-face). A cost-effectiveness analysis of the present GRx research study has not been undertaken, and it is acknowledged that the inclusion of adherence rates in an analysis of cost would add value to the ability of this research study to inform policy.

One of the biggest concerns for Aotearoa New Zealand and other countries is the widening gap in socio-economic status, food security education and housing between the richest and poorest. The high transience of Māori, in comparison to New Zealand Europeans, could explain this gap between Māori and European. Transience was associated with pressures of family and costs, which suggested that there were other barriers to health care and the ability to actively participate in physical activity

programmes (Baxter, 2002). An understanding of the services and how to access them is a known barrier to self-care (Simmons, Lillis, Swan, & Haar, 2007). In this GRx research study, the ability of the participant to access and engage in the GRx health service was also considered to be a barrier. Qualitative consideration of barriers and challenges associated with the present studies GRx health service is covered in more detail in Chapters 6 and 7. However, future work is needed to look at ways of removing or reducing barriers to participation.

#### **4.4.3 Conclusion**

The processes applied followed kaupapa Māori research and bicultural principles for improving an understanding of how physical activity and nutrition can be used to improve insulin resistance. This process was associated with some evidence of improved recruitment, engagement and adherence for Māori. The relationship built with the researcher from the initial meeting contributed to their engagement. In the initial kanohi-ki-te-kanohi (face-to-face) interviews, the present GRx research study was explained and appeared to have improved adherence, which underpins the importance of informed consent and health literacy. Furthermore a kanohi-ki-te-kanohi (face-to-face) approach over six months may be associated with higher rates of participation than waea but, as attrition was high, a difference in adherence at 12 months could not be shown.

Provision of a consistent explanation and description of the health service by the researcher in the kanohi-ki-te-kanohi (face-to-face) mode was associated with equal recruitment rates for Māori and New Zealand European. Some evidence was provided that the interaction of the health service provider kanohi-ki-te-kanohi (face-to-face) was associated with better retention and adherence for Māori at six months. Transience

explained a large proportion of the difficulty for Māori in receiving health services in a consistent manner.

## Chapter 5 **Physical and metabolic outcomes**

### **5.1 Introduction**

Achieving optimal blood glucose control, lipid concentrations, weight and arterial blood pressure, are the main outcomes of treatment for those newly diagnosed with T2DM. These outcomes are often achieved through increased physical activity and eating an improved quality of foods (T. G. Pavey, N. Anokye, et al., 2011), as well as pharmacological treatment, when required (Holman, Paul, Bethel, Neil, & Matthews, 2008; Inzucchi, 2002; D. M. Nathan et al., 2009). Body weight, systemic arterial blood pressure, blood glucose and lipid targets have been recommended by the New Zealand Guidelines Group (New Zealand Guidelines Group, 2012). The main marker of long term blood glucose control is the glycated haemoglobin (HbA1c) (American Diabetes Association, 2014; Kirkman et al., 2012; Nathan, Balkau, & Bonora, 2009). The national GRx health service aims to reduce the risks associated with T2DM and obesity through reductions in body weight, waist circumference and increased physical activity. Intensive one-on-one support and advice about the quality and quantity of physical activity and foods, presented by a lifestyle coach (Elley et al., 2004), should help control blood glucose (thereby, improving HbA1c) and lipid concentrations.

Given the high prevalence of T2DM in Māori there is a need to understand better how health outcomes can be improved after diabetes has been diagnosed. The existing national GRx health service (a three month telephone intervention) was modified (a six month intervention) for this GRx research study to see if physical measurements (i.e. body weight, waist circumference, systolic and diastolic blood pressures and resting heart rate) and metabolic measurements (i.e. HbA1c, lipids - total cholesterol (TC), high density lipoprotein (HDL), total cholesterol/high density lipoprotein (TC/HDL-C ratio)

and triglycerides) could be improved through better engagement with participants. The GRx was then delivered in a research study that compared in men and women newly diagnosed with T2DM the two modes of delivery and the two ethnic groups. The aim of the work presented in this chapter was to assess the overall effect of the GRx health service by comparing: physical changes and metabolic changes, at six months and 12 months for Māori and New Zealand European adult women and men. It is proposed that the kanohi-ki-te-kanohi (face-to-face) mode of delivery will present with greater positive outcome trends in both physical and metabolic changes than the waea (telephone) mode of delivery. The immediate effects would also be assessed at six months and sustainability assessed by measures at 12 months, again, with the presumption that the physical and metabolic outcome measures compared within the present GRx research study will also be compared with other studies.

## **5.2 Methods**

The methods section in Chapter 4 described the details regarding engagement and active participation. This GRx research study compared Māori with New Zealand European and with two modes of delivery of intervention – waea (telephone) and kanohi-ki-te-kanohi (face-to-face). The recruitment target was to assess 280 adults newly diagnosed with T2DM at six months, to determine any differences in reduction of weight between the two modes of delivery. It was presumed that for a 4 kg loss, a standard deviation of 8 kg: power 80%  $p < 0.05$ , was required. A 10% drop-out was allowed for the 280 participants (see Chapter 3 – Methods and Study Design). The final randomised trial design tested for difference in mode of delivery, ethnicity (Māori versus New Zealand European) and gender.

### 5.2.1 Physical measurements

Physical measurements were collected at three time points by the researcher - baseline, six months and 12 months. These included measurements and assessment of height (to the nearest 0.5 cm) without shoes using a portable stadiometer (PE87 portable stadiometer Mentone Educational, Moorabbin, Victoria, Australia); total body weight [to the nearest 0.1 kg] in light clothing and without shoes (Wedderburn Electronic Scale 0-150 kg, Auckland, New Zealand); standing waist circumference (to the nearest 0.5 cm) was assessed by placing a measuring tape at the lateral mid-point between the lower rib and the iliac crest. After a minimum sitting period of 5 min, systemic arterial blood pressure (systolic blood pressure and diastolic blood pressure [to the nearest 1 mmHg] and resting heart rate [to the nearest 1 beat/min]) were measured using an Omron IntelliSense Automatic Blood Pressure Monitor with an arm cuff, Kyoti, Japan. Body mass indices (BMI) were calculated from the raw measurements of total body weight and height measurements of each participant. All measurements were undertaken in triplicate and averaged (see Appendix N for a detailed description about the tools and processes used to collect the measurements).

The same physical measurements were also made by the general practitioner and/or practice nurse and were then compared with measurements taken by the researcher at approximately the same three time points (Section 5.2.3). Physical and metabolic data obtained by the researcher and general practitioner were in good agreement. Systolic and diastolic blood pressure was moderately correlated (Pearsons  $r = 0.6$ ) by the researcher and general practitioner at each time point. The correlation between these physical measures at the different times and in different environments showed a reasonable convergent validity for the measurements.

### 5.2.2 Metabolic measurements

All biochemical analyses were undertaken by Path Lab Waikato Limited with accreditation through quality assurance to NZS/ISO 15189:2007 standard by International Accreditation New Zealand measurements, including: i) HbA1c; ii) lipid concentration (TC, HDL, TC/HDL C-ratio; and iii) triglycerides. Not all participants in the GRx programme had metabolic measurements taken, in spite of repeated attempts to obtain these data. These measurements were entered into an Excel™ spreadsheet by a third person.

### 5.2.3 Statistical analyses

For each variable measured more than once at each time point, the average value was calculated and used for subsequent analysis. Categorical measures included ethnic group, gender and mode of delivery. Descriptive statistics, such as mean, standard deviation and 95% CI were used to summarise the continuous variables and the categorical variables are reported in both frequency and percentages. Any differences between the groups for percentages were determined from the overlap of the 95% CI, as follows: The 95% CI for the frequency of each categorical variable was determined from the probability equation based on the distribution curve. An Excel™ spreadsheet was used to calculate these data. Each standard deviation is presented as  $\pm$  width of the  $CI = 1.96 * \text{square root of the percentage response} * (100 - \text{percentage response}) / \text{number in each category}$  (see Chapter 4 for an example). Following the formula above, the width of the CI either side of the percentage was 7.5%, or the rounded CI for 61% was between 54 and 69%. The interval depended on the total number in each group and the number who met the criteria. The overlap of the 95% CIs indicated the differences in findings between the categories were not statistically significant or meaningful.

Analysis of variance (ANOVA) was used to examine for differences among the categorical variables of ethnicity, mode of delivery and gender and repeated measures ANOVA to examine changes over time. T-tests were used to evaluate the mean differences between the categories within the groups. Pearson correlation coefficients were used to identify the associations among the changes in the physical and metabolic measures made by the researcher and the metabolic outcomes reported by the laboratory or general practitioner. Where both the general practitioner and Pathlab measurements were taken by the same person, the association between the measurements made in the same time frame was tested by correlation analysis.

For regression modeling, the continuous data were log transformed to compensate for the skew of the residuals. The Tukey adjustment multiple comparison procedure was used for *post hoc* comparisons at the three different time points, after assessing for statistically significant differences between the group means ( $P < 0.05$ ). A mathematician/biostatistician consultant undertook this analysis, with the outcomes being discussed with the researcher. Statistical analyses were performed using the lme package, R v2.12 software and IBM SPSS Statistics version 20 (IBM Corporation, Armonk, New York).

## **5.3 Results**

### **5.3.1 Baseline measurements**

Consent to participate in this GRx research study was provided by 152 participants (Table 5.1), of whom 138 were self-identified as either Māori (n=68) or New Zealand European (n=70). Overall, there were almost twice as many women as men participating (96 vs. 56); this difference was present within all ethnic groups. There were no significant differences in age between Māori and New Zealand European or

between women and men (Table 5.1). However, there was a tendency for women to be older and New Zealand Europeans to be older. On average, women were 16 kg lighter ( $P < 0.001$ ), 13 cm shorter ( $P < 0.001$ ) and their waist circumferences were 6 cm smaller ( $P < 0.028$ ) than men. The waist to height ratio was not different between women and men ( $\sim 0.75$   $P = 0.48$ ) but was significantly greater than the guideline of 0.50 (Ashwell & Gibson, 2009; R. W. Taylor et al., 2011). Systolic and diastolic blood pressures did not differ by gender (Table 5.1).

Table 5.1

*Baseline physical measures by ethnicity and gender*

	<b>Māori (n=68)</b>		<b>New Zealand European (n=70)</b>		<b>Other (n=14)</b>	
Measures	Women	Men	Women	Men	Women	Men
n	39	29	47	23	10	4
Age (year)	53 (10) [35, 74]	56 (12) [35, 80]	57 (13) [30, 83]	62 (13) [38, 86]	51 (15) [34, 78]	52 (14) [37, 70]
Body weight (kg)	106.9 (27.2) [57.5, 185.9]	117.4 (21.0) [72.8, 157.0]	96.8 (23.7) [47.6, 152.9]	112.2 (25.4) [71.2, 159.3]	99.4 (22.9) [63.2, 127.1]	143.8 (38.9) [107.5, 186.2]
Height (cm)	160.3 (6.5) [146.0, 172.0]	172.8 (6.1) [157.4, 185.3]	159.2 (6.8) [143.5, 177.6]	173.8 (6.7) [163.3, 186.1]	162.0 (5.8) [149.8, 169.9]	177.0 (4.9) [171.0, 181.2]
BMI (kg/m <sup>2</sup> )	41.5 (9.9) [24.1, 67.6]	39.3 (6.5) [25.5, 50.4]	38.2 (9.6) [20.7, 70.2]	36.9 (6.9) [26.0, 51.6]	37.7 (8.2) [28.2, 50.8]	45.9 (12.3) [34.8, 60.8]
Waist circumference (cm)	125.5 (18.7) [90.7, 167.6]	125.6 (16.1) [86.6, 157.0]	116.1 (16.4) [78.0, 141.9]	126.3 (17.4) [92.5, 164.4]	120.6 (13.2) [99.6, 138]	141.5 (20.5) [121.0, 165.0]
Waist/Height	0.78 (0.12) [0.57, 1.03]	0.73 (0.09) [0.51, 0.91]	0.73 (0.10) [0.51, 0.90]	0.74 (0.12) [0.56, 1.14]	0.74 (0.08) [0.64, 0.86]	0.80 (0.11) [0.67, 0.91]
Systolic BP (mmHg)	142 (19) [102, 179]	138 (19) [106, 172]	138 (20) [107, 183]	139 (17) [107, 183]	143 (17) [120, 179]	149 (22) [132, 180]
Diastolic BP (mmHg)	88 (12) [68, 122]	86 (12) [54, 113]	80 (13) [54, 112]	80 (10) [61, 98]	83 (7) [69, 90]	98 (15) [81, 117]
Resting heart rate (beat/min)	74 (11) [53, 94]	72 (12) [51, 101]	72 (13) [49, 100]	70 (11) [52, 91]	77 (8) [66, 88]	84 (9) [75, 97]

Data are presented as mean (standard deviation) and range [minimum, maximum]; n, number of participants; BMI = body mass index; BP = blood pressure.

Table 5.2

*Baseline metabolic measures by ethnicity and gender*

Measures	Māori (n=41)		New Zealand European (n=51)		Other (n=10)	
	Women	Men	Women	Men	Women	Men
n	22	19	36	15	7	3
[HbA1c] (%)	8.5 (2.0)	8.8 (2.2)	7.5 (1.9)	8.4 (2.1)	8.2 (1.3)	7.3 (1.8)
	[5.7, 13.6]	[5.9, 13.3]	[5.7, 13.3]	[6.4, 13.0]	[6.9, 10.8]	[6.2, 9.2]
[High density lipoprotein]	1.1 (0.6)	0.9 (0.2)	1.0 (0.3)	0.8 (0.2)	0.9 (0.1)	0.9 (0.1)
(mmol/L)	[0.4, 3.4]	[0.6, 1.4]	[0.5, 1.7]	[0.6, 1.26]	[0.7, 1.0]	[0.8, 1.1]
[Total cholesterol]	5.3 (1.1)	5.4 (1.6)	5.2 (1.9)	5.6 (1.4)	5.6 (1.7)	4.4 (0.1)
(mmol/L)	[3.7, 7.7]	[4.0, 9.2]	[2.6, 12.2]	[3.3, 8.3]	[4.4, 9.2]	[4.3, 4.5]
[Triglycerides]	2.3 (1.4)	2.5 (2.6)	2.4 (1.8)	2.2 (1.4)	2.1 (1.7)	1.0 (0.1)
(mmol/L)	[0.6, 6.8]	[0.6, 10.0]	[0.6, 10.0]	[0.8, 5.3]	[0.8, 5.8]	[0.9, 1.0]

Data are presented as mean (standard deviation); range [minimum, maximum]; n, number of participants; HbA1c = glycated haemoglobin

Table 5.3

*Physical measures and numbers measured by modes of GRx delivery*

Measures	Waea/telephone (n=72)			Kanohi-ki-te-kanohi/face-to-face (n=80)		
	Baseline	6 months	12 months	Baseline	6 months	12 months
Body weight (kg)	104.9 (27.8)	103.9 (25.5)	103.1 (27.4)	108.5 (24.4)	108.4 (27.8)	109.1 (27.5)
95% CI	(98.4, 111.5)	(95.8, 112.1)	(93.1, 113.2)	(103.1, 114.0)	(100.8, 116.0)	(99.9, 118.2)
n	72	40	31	80	54	37
Waist circumference (cm)	121.8 (18.7)	120.8 (21.5)	118.2 (19.9)	125.3 (19.1)	120.5 (18.6)	119.9 (17.2)
95% CI	(117.4, 126.2)	(113.9, 127.6)	(110.9, 125.5)	(121.0, 130.0)	(115.4, 125.5)	(114.2, 124.7)
n	71	40	31	80	54	37
Systolic BP (mmHg)	135 (18)	134 (16)	133 (17)	144 (19)	144 (12)	141 (22)
95% CI	(131, 140)	(129, 139)	(127, 140)	(139, 148)	(138, 150)	(133, 148)
n	71	39	30	79	52	34
Diastolic BP (mmHg)	82 (11)	79 (12)	77 (13)	87 (13)	83 (13)	83 (11)
95% CI	(79, 84)	(75, 82)	(72, 82)	(83, 89)	(79, 87)	(79, 87)
n	70	39	30	79	52	34

Data are presented as mean (standard deviation); CI, confidence intervals expressed as (lower bound, upper bound); n, number of participants; GRx = Green prescription; BP = blood pressure

### 5.3.2 Effect of Intervention

From this point onwards the analysis is only shown for Māori and New Zealand European physical and metabolic outcomes at six and 12 months, as per Table 5.4.

Table 5.4

*Overall numbers of Māori and New Zealand European participants measured at baseline, six months and 12 months for both physical and metabolic outcomes*

Measures	Physical outcomes			Metabolic outcomes		
	Baseline	6 months	12 months	Baseline	6 months	12 months
Māori + NZE	138	88	59	102	63	36
Māori		35	20		25	12
NZE		53	39		38	24

NZE = New Zealand European

#### *6-month physical outcomes*

Thirty-five Māori and 53 New Zealand European were measured at six months (Table 5.4). For these 88 participants there was an overall reduction in body weight of 1.6 kg (95% CI, 0.3 to 2.8). There were no significant differences between the GRx mode of delivery, ethnicity or gender. There was also an overall reduction in waist circumference of 3.6 cm (95% CI, 2.4 to 4.9), but there were no significant differences among the GRx mode of delivery (Table 5.5), ethnicity or gender.

#### *6-month metabolic outcomes*

Twenty five Māori and 38 New Zealand European who received the intervention also had their HbA1c measured at six months (Table 5.6). For these 63 participants there was an overall reduction in HbA1c of 1.3% (95% CI, 0.3 to 2.4). There were no significant differences among the GRx mode of delivery, ethnicity or gender. For these

63 participants no other metabolic measurements showed any significant change between baseline and six months.

Table 5.5

*Physical measures of 93 participants who had valid weight measures by ethnicity and gender at the 6-month time point*

Measures	Māori (n=35)		New Zealand European (n=53)		Other (n=5)	
	Women	Men	Women	Men	Women	Men
n	20	15	38	15	3	2
Age (year)	53 (10) [35, 74]	55 (11) [36, 72]	57 (14) [30, 83]	63 (13) [38, 80]	61 (5) [55, 66]	59 (16) [37, 70]
Body weight (kg)	107.9 (23.2) [71.4, 146.1]	117.3 (16.1) [85.4, 140.6]	95.4 (24.2) [50.8, 152.0]	114.4 (27.8) [70.8, 161.3]	100.4 (36.3) [60.4, 131.4]	110.5 (3.5) [108.0, 113.0]
Height (cm)	160.6 (6.5) [150.0, 172.0]	172.9 (57.0) [165.1, 185.5]	158.7 (7.0) [143.5, 177.6]	174.4 (7.1) [164.2, 186.1]	158.4 (8.7) [149.8, 167.2]	176.1 (72.1) [171.0, 181.2]
BMI (kg/m <sup>2</sup> )	41.7 (9.0) [28.2, 56.7]	39.0 (4.1) [29.2, 45.3]	37.7 (9.9) [21.7, 68.2]	37.4 (7.8) [24.6, 52.3]	39.2 (10.8) [26.9, 47.0]	35.7 (1.8) [34.4, 36.9]
Waist circumference (cm)	123.2 (17.4) [95.7, 152.8]	125.2 (12.1) [100.2, 145.5]	111.9 (16.0) [75.8, 140.0]	125.6 (20.5) [88.9, 161.0]	116.3 (22.1) [94.0, 138.2]	117.5 (1.7) [116.3, 118.7]
Systolic BP (mmHg)	143 (16) [122, 171]	139 (27) [116, 220]	138 (19) [107, 186]	144 (18) [106, 175]	139 (17) [129, 159]	161 (21) [147, 177]
Diastolic BP (mmHg)	86 (9) [76, 109]	83 (14) [67, 120]	76 (13) [47, 106]	81 (13) [65, 107]	78 (7) [71, 83]	99 (11) [91, 106]
Resting heart rate (beat/min)	73 (9) [58, 88]	75 (13) [57, 102]	75 (14) [48, 110]	75 (16) [51, 105]	71 (3) [68, 74]	69 (13) [60, 78]

Data are presented as mean (standard deviation); range [minimum, maximum]; n, number of participants; BMI = body mass index; BP = blood pressure

Table 5.6

*Metabolic measures by modes of GRx delivery for those who received six months of intervention*

Measures	Waea/telephone (n=30)			Kanohi-ki-te-kanohi/face-to-face (n=35)		
	Baseline	6 months	12 months	Baseline	6 months	12 months
HbA1c (%)	8.2 (2.1)	8.1 (1.9)	7.7 (1.9)	8.0 (2.0)	7.6 (1.7)	7.2 (1.4)
95% CI	(7.7, 8.8)	(7.5, 8.6)	(6.7, 8.7)	(7.4, 8.5)	(7.1, 8.2)	(6.6, 7.9)
n	51	30	17	51	35	20
[High Density Lipoproteins] (mmol/L)	1.0 (0.2)	1.0 (0.2)	1.0 (0.2)	1.0 (0.3)	1.0 (0.4)	1.0 (0.3)
95% CI	(0.9, 1.1)	(0.9, 1.1)	(0.9, 1.1)	(0.9, 1.1)	(0.9, 1.2)	(0.9, 1.1)
n	48	26	17	48	33	20
[Total Cholesterol] (mmol/L)	5.3 (1.5)	4.5 (1.0)	4.7 (1.5)	5.4 (1.7)	4.7 (1.6)	5.3 (3.0)
95% CI	(4.9, 5.7)	(4.1, 4.9)	(3.9, 5.5)	(4.9, 5.9)	(4.2, 5.3)	(3.8, 6.7)
n	47	25	17	51	33	20
[Triglyceride] (mmol/L)	2.4 (2.1)	2.1 (1.8)	2.5 (2.7)	2.2 (1.5)	1.9 (1.6)	2.3 (2.3)
95% CI	(1.8, 3.0)	(1.4, 2.9)	(1.1, 3.9)	(1.8, 2.6)	(1.4, 2.5)	(1.3, 3.4)
n	49	27	17	51	33	20

Data are presented as mean (standard deviation); CI, Confidence intervals expressed as (lower bound, upper bound); n, number of participants; GRx = green prescription; HbA1c (%) = glycated haemoglobin

Table 5.7

*Physical measures obtained by the researcher for each mode of delivery*

Measures	Waea/telephone (n=33)			Kanohi-ki-te-kanohi/face-to-face (n=28)		
	Baseline	6 months	12 months	Baseline	6 months	12 months
Body weight (kg)	107.5 (27.2)	105.5 (26.8)	104.0 (26.9)	108.4 (26.6)	104.4 (22.4)	107.8 (27.1)
95% CI	(96.7, 118.3)	(95.9, 116.1)	(93.4, 114.7)	(99.1, 117.7)	(96.5, 112.4)	(98.3, 117.2)
Waist circumference (cm)	124.4 (17.7)	120.2 (17.7)	118.3 (17.1)	123.7 (17.8)	119.8 (17.4)	119.1 (17.2)
95% CI	(117.4, 131.4)	(113.2, 127.2)	(111.5, 125.0)	(117.5, 129.9)	(113.8, 125.9)	(113.1, 125.1)
Systolic BP (mmHg)	137 (15)	134 (14)	134 (16)	145 (22)	148 (24)	141 (22)
95% CI	(131, 143)	(129, 140)	(128, 141)	(138, 153)	(139, 156)	(133, 150)
Diastolic BP (mmHg)	82 (11)	78 (12)	78 (13)	87 (17)	85.4 (14)	82.6 (11)
95% CI	(78, 87)	(73, 83)	(73, 83)	(81, 93)	(80, 91)	(78, 87)
Resting heart rate (beat/min)	73 (11)	75 (11)	75 (11)	73 (13)	74 (16)	73 (15)
95% CI	(69, 77)	(71, 79)	(71, 80)	(67, 78)	(67, 80)	(67, 79)

Data are presented as mean (standard deviation); CI, Confidence intervals expressed as (lower bound, upper bound); n, number of participants; BP = blood pressure

### *Physical outcomes at 12 months, a measure of sustainability*

Twenty Māori and 39 New Zealand European had body weight measured at 12 months (Figure 5.1). For these 59 participants differences between baseline and 12 months showed an overall reduction of 2.3 kg (95% CI, 0.5 to 4.0). There were no significant differences based on GRx mode of delivery, ethnicity or gender. For those 59 participants, there was also an overall reduction in waist circumference, between baseline and 12 months, of 5.5 cm (95% CI, 3.4 to 7.6). There were no significant differences noted in waist circumference reductions among the GRx mode of delivery, ethnicity or gender.

### *Metabolic outcomes at 12 months: a measure of sustainability*

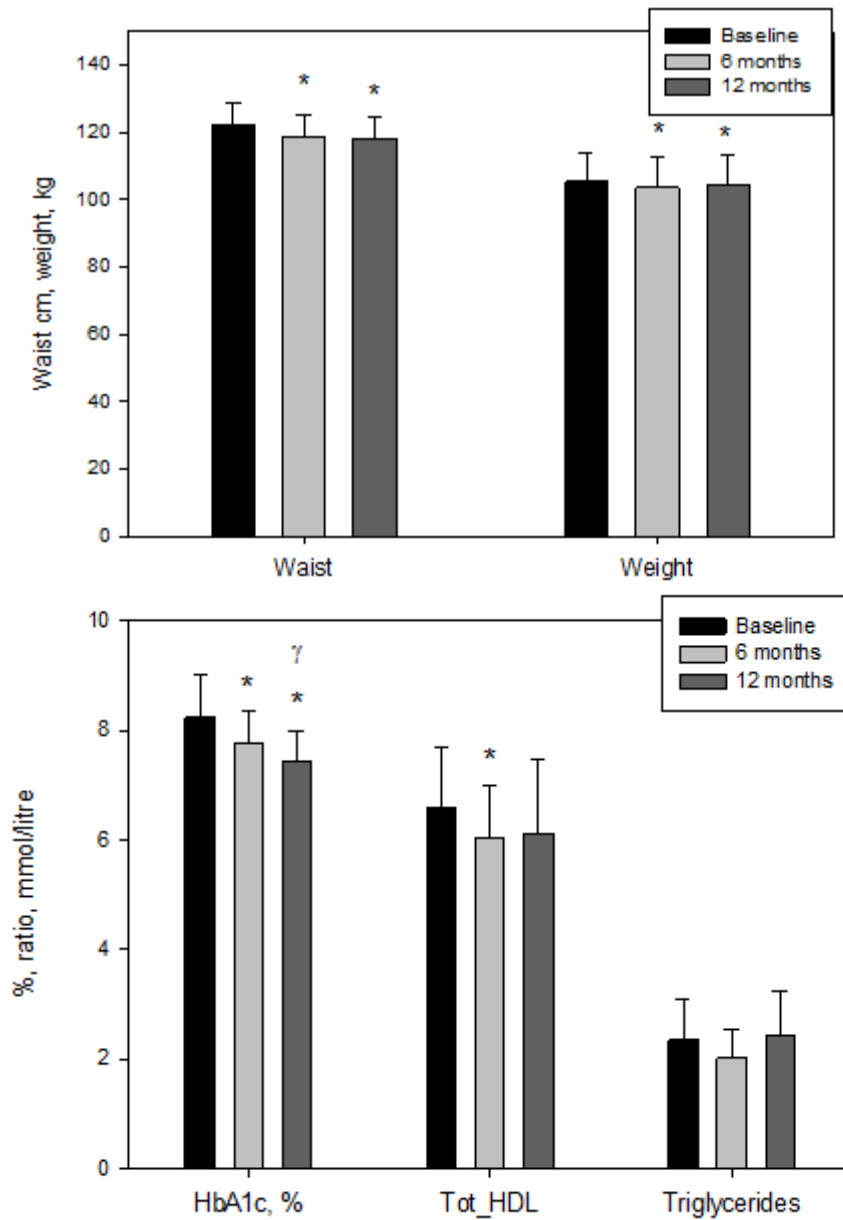
Twelve Māori and 24 New Zealand European had HbA1c measured at both six months and 12 months (Figure 5.2). For these 36 participants HbA1c, between baseline and 12 months, was reduced by 0.6% (95% CI, 0.0 to 1.3). The reduction between six months and 12 months was 0.3% (95% CI, 0.0 to 0.7). There were no significant differences among the GRx mode of delivery, ethnicity or gender. At 12 months those same participants TC/HDL-C ratio were also measured. There was no significant difference for the TC/HDL-C ratio among the three time points.

### *Physical and metabolic outcomes*

There were only 36 participants measured at both six months and 12 months. For those participants body weight [ $F(2, 35) = 1.03, p < 0.023$ ], waist circumference [ $F(2, 35) = 13.9, p < 0.001$ ] and HbA1c [ $F(2, 35) = 8.18, p < 0.058$ ] reduced at six months and 12 months compared with the baseline (repeated measures ANOVA, Figure 5.1). Only HbA1c had a further reduction at 12 months [ $F(2, 35) = 8.18, p < 0.007$ ]. There was no

apparent effect based on mode of delivery, ethnicity or gender. In real terms, between baseline and 12 months, the mean reduction in body weight was 1.1 kg (95% CI, -2.9 to -0.8); the waist circumferences reduced by 4.1 cm (95% CI, -6.3 to -2.0) and HbA1c reduced by 0.6% (95% CI, 0.0 to 1.3). For all participants, including the 'Other' ethnic group, the relationships among change in body weight, waist circumference, HbA1c and TC/HDL-C ratio were assessed at six months. Reductions in body weight and waist circumference were strongly and positively associated ( $r=0.63$ ,  $p < 0.001$ ,  $n=91$ ). There were no associations among body weight and waist circumference and HbA1c, TC/HDL-C ratio [ $F(2, 35) = 1.64$ ,  $p < .036$ ] and triglycerides [ $F(2, 35) = .131$ ]. At 12 months any differences from baseline in physical and metabolic measures were not associated.

The scatter plots (Figures 5.2 and 5.3) compared baseline HbA1c with those who had all measurements taken (physical and metabolic) at baseline, six months ( $n=65$ ) and 12 months ( $n=37$ ). Therefore, the scatter plots, in general, showed that change among the participants was related or correlated with the reduction or increase in HbA1c concentrations. The key outcome was that more people improved ( $>0$  change) than declined and the positive slope showed the absolute change was greatest in those who had higher HbA1c from the outset. That is, HbA1c decreased.



\* = Significantly different to baseline. HbA1c = glycated haemoglobin; Tot\_HDL (aka TC/HDL\_C ratio) = total cholesterol/high density lipid \_ cholesterol ratio. Error bars, 95% CI mean.

Figure 5.1. Changes in physical (*upper*) and metabolic (*lower*) for 36 participants who had measurements at all the time points

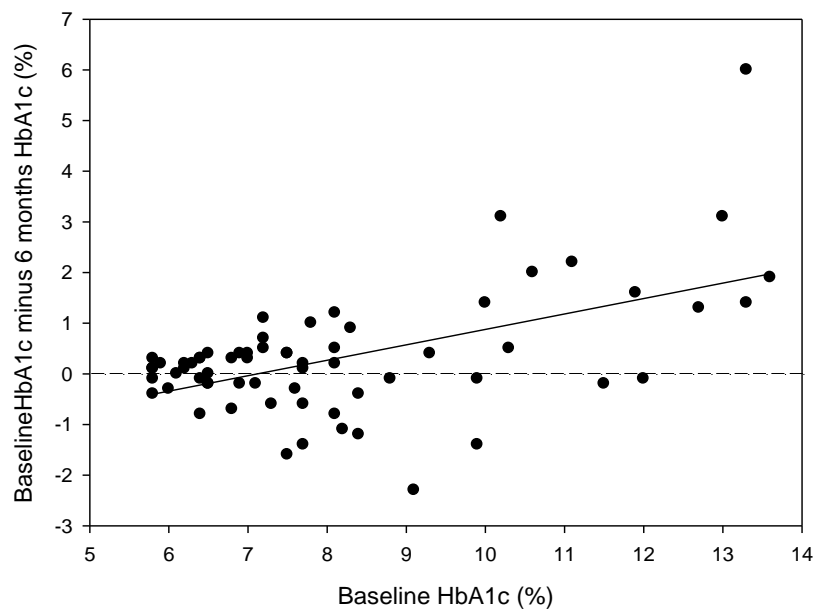


Figure 5.2. Baseline to six months – n=65,  $r^2 = 0.29$ ; mean change from baseline in HbA1c % =  $0.3 \times \text{baseline HbA1c} - 2.2\%$

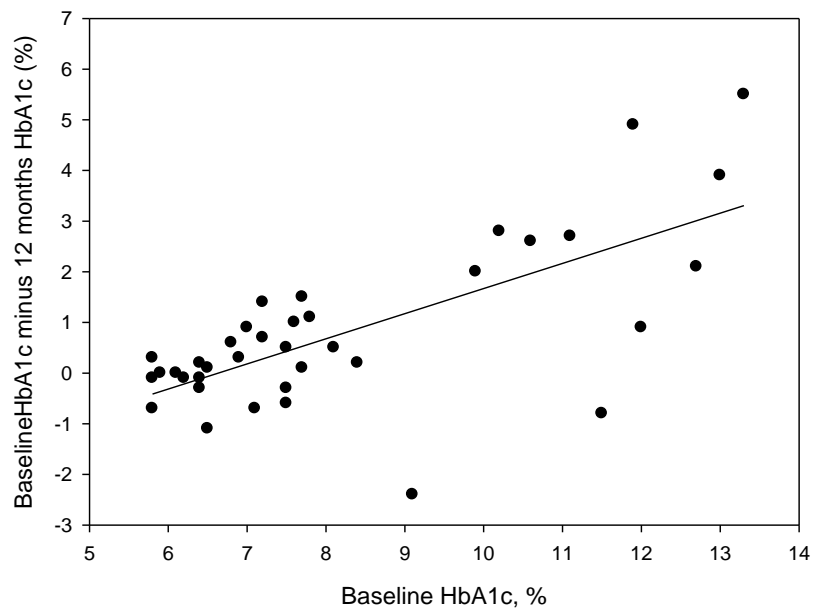


Figure 5.3. Baseline to 12 months – n=37,  $r^2 = 0.49$ ; 12 month change in HbA1c % =  $0.50 \times \text{baseline HbA1c} - 3.3\%$

## 5.4 Discussion

This is the first GRx research study to assess the effectiveness of the national GRx health service after six months treatment and at the 12-month follow-up with a near equal representation of Māori and New Zealand European newly diagnosed with T2DM. There was a reduction in the participants' physical (i.e. body weight and waist circumference) and metabolic measurements (i.e. HbA1c concentrations) after six months of GRx intervention. These reductions persisted at 12 months, despite no one-on-one intensive support from the GRx kaiwhakahaere (facilitator). That is, the participants' physical and metabolic outcomes had not declined between six and at the 12-months. Of these changes the most important was ~1% HbA1c reduction at both time points. This reduction is, notably, the definitive factor associated with reductions in diabetes complications in T2DM (UK Prospective Diabetes Study (UKPDS) Group, 1998; Wing et al., 2013). The largest reduction in HbA1c concentration occurred for those participants who presented the highest risk values (Figures 5.2 and 5.3) associated with T2DM and cardiovascular diseases. An improved blood glucose control is associated with a reduction in the risk of cardiovascular diseases (T. G. Pavey, A. H. Taylor, et al., 2011; D. Thomas & Elliott, 2009; UK Prospective Diabetes Study (UKPDS) Group, 1998; Wing et al., 2013). Furthermore, a reduction in HbA1c concentration (>1%) can be associated with one fewer tablet consumed by the participant (UK Prospective Diabetes Study (UKPDS) Group, 1998; Wing et al., 2013). However, weight loss, which is associated with greater reductions in HbA1c and greater initial improvements in fitness, did not reduce the occurrence of cardiovascular events in overweight or severely obese adults with T2DM (The Look Ahead Research Group, 2013). Similar to the present research study, the strongest changes occurred when the intervention applied ended at six months or 12 months, in particular, among those

participants presenting with the highest biomarker risks (i.e. HbA1c >0.8%, and BMI > 30 kg/m<sup>2</sup>) (T. G. Pavey, A. H. Taylor, et al., 2011; UK Prospective Diabetes Study Group, 1998).

There was no difference in reduction of body weight, waist circumference and HbA1c at six months by GRx mode of delivery [waea (telephone) or kanohi-ki-te-kanohi (face-to-face)] for Māori and New Zealand European, and women and men. The main differences identified between the participants in the present GRx research study and those in other studies (Figure 5.2) were a higher BMI ( $\geq 40$  kg/m<sup>2</sup> compared to 26 to 34 kg/m<sup>2</sup>). The lipid profiles in the present GRx research study revealed higher risks than those participants in other randomised controlled trials (The Look Ahead Research Group, 2013; UK Prospective Diabetes Study Group, 1998). Therefore, while the magnitude of the favourable changes were small in physical and metabolic measures, it was clear that any small change in the right direction was better than no change. That is, the participants overall health did not deteriorate.

Based on extensive randomised controlled trial evidence, strategies for cardiovascular risk reductions for those newly diagnosed with T2DM also emphasised the importance of lipid-lowering therapy (UK Prospective Diabetes Study (UKPDS) Group, 1990).

This meant that, at the very least, the GRx health service under investigation in this research study did no harm. Hence, the conclusive finding in this GRx research study was that the GRx health service improved glycaemic status for both Māori and New Zealand European women and men regardless of which mode of delivery they received.

The next feature of note was the reductions in body weight and waist circumference. These risk factors improved in the present GRx research study at six months and were comparable with findings of similar studies involving physical activity and nutrition

support for individuals diagnosed with medical conditions, in particular T2DM, obesity and sedentary behaviour, both globally (Andrews et al., 2011; Wing et al., 2013) and locally (Coppell et al., 2010; Elley, Kenealy, Robinson, Bramley, et al., 2008; Elley, Kerse, Arroll, et al., 2003; Foley et al., 2011; Krebs, Parry-Strong, et al., 2013). Similar to the present GRx research study, the greatest physical improvements were found during the first year of intervention and were partly sustained (Nield et al., 2007; T. G. Pavey, A. H. Taylor, et al., 2011; D. Thomas & Elliott, 2009).

Improved nutrition and increased physical activity reduces the quantity of central fat, especially the quantity of intra-abdominal fat. This was seen as a reduction in total body weight and waist circumference measurement. Reduction in intra-abdominal fat may be the mechanism that drove the improvement in glycaemic control as intra-abdominal fat produced many factors associated with metabolic risk (Despres, 2009; Despres & Lemieux, 2006).

#### **5.4.1 Strengths and limitations**

In the present GRx research study, a key strength was the inclusion of a large sample of physical and metabolic data from a sample of Māori adult participants newly diagnosed with T2DM. Theoretically, such evidence can provide comparative evidence among other randomised controlled trials for those receiving the GRx health service. One perceived limitation was that there was no control (no treatment) group because in order to do a study ethically, and, therefore, it was difficult to know if the improvements in anthropometry and glycated haemoglobin were due to the intervention, medication or to the realisation by the participant that they had T2DM. A further limitation of the present GRx research study was that medication use and changes in prescribed medication for hypertension or asthma and/or tobacco use were not measured. In

addition, there were also a number of other diseases and daily life and mental health issues that affected the participant's ability to respond to the intervention (Chapter 7). Socioeconomic status was not measured or accounted for, but in common with national statistics for the prevalence of diabetes (Ministry of Health, 2012b), the participants were mainly of lower socioeconomic status (personal observation). The small number of participants in each group who completed the GRx intervention, and were measured at 12 months (n=37), which ultimately underpowered the follow-up.

#### **5.4.2 Future research work**

The findings in the present GRx research study suggests more referrals from GPs in larger cohorts of Māori, by taking into account confounders such as medication, socioeconomic status and the ability of the individual to respond to the intervention is important. If confirmed in larger cohorts, changes in lifestyle may influence an effective non-pharmacological strategy for reducing body weight and waist circumference, as well as lowering HbA1c concentrations in Māori people. These suggestions to investigate lifestyle programmes further supported Elley et al.'s, (2010; 2004) findings and provided more evidence specific to the ways of increasing Māori participation, such as the first kanohi-ki-te-kanohi (face-to-face) contact. The advantages and disadvantages for the delivery mode of the GRx are investigated in Chapters 6 and 7.

#### **5.4.3 Conclusions**

In conclusion, this GRx research study has indicated that the adoption of the GRx health service appeared to improve body weight, waist circumference and HbA1c after six months of interaction with a kaiwhakahaere (facilitator), and that can be sustained at 12 months in people newly diagnosed with T2DM in both Māori and New Zealand

European people. There is an urgent need for well-designed studies which examined modifications of the GRx health service, at various points during follow-up, although the present research study has produced promising outcomes.

## **Chapter 6 Physical activity, exercise intent, attitudes, empowerment: relationship to biological changes**

### **6.1 Introduction**

In this chapter, participant levels of physical activity, their exercise intent, attitudes and empowerment in relation to biological changes were assessed. It is known that individualised behavioural strategies to improve self-management of physical activity levels result in sustainable improvements in blood glucose and lipid concentrations (T. G. Pavey, A. H. Taylor, et al., 2011). A randomised controlled trial and a systematic review of interventions that included the promotion of self-management techniques showed a positive impact on diabetes-related health outcomes (R.M. Anderson et al., 2009; Norris et al., 2002). The behavioural outcomes included increased diabetes-related knowledge and improved blood glucose monitoring, dietary habits and glycemic control. Behaviour changes can be assessed by asking the same questions about intent, attitude and empowerment over the course of an intervention using motivational interviewing techniques (Eigenmann, Colagiuri, Skinner, & Trevena, 2009; Rubak, Sandbaek, Lauritzen, Borch-Johnsen, & Christensen, 2009). Motivational interviewing techniques are used to promote self-management. Therefore, the first aim of the present GRx research study, in this chapter, was to understand an individual's readiness to change and, second, how encouraging and supportive the GRx Māori kaiwhakahaere was; as well as the provision of practical advice and resources tailored for the individual to participate in a more active lifestyle (Miller & Rollnick, 2009; Prochaska, DiClemente, et al., 1992). It was presumed that a more active lifestyle should lead to an individual achieving their personal goals to manage illnesses such as T2DM (Miller & Rollnick, 2009).

The delivery of the New Zealand GRx has changed since the mid-1990s (Swinburn, Walter, Arroll, et al., 1998) and evidence has been provided in that the increased physical activity impacted favourably on health outcomes (Elley, Kerse, Arroll, et al., 2003; M. Johnson & Wood, 2013; Pringle, 2008). A key desired health outcome of a GRx health service was that an individual became more physically active and maintained that level of activity after the GRx support stopped. It also had provision for group participation, for example, walking or swimming groups and other activities that fell under the role of regional sports trusts (M. Johnson & Wood, 2013).

Obtaining objective measurements of physical activity such as duration, frequency and intensity, is difficult unless technologies such as accelerometers are used. However, the use of accelerometers requires money, trained staff, and high participant compliance. Hence, surveillance of physical activity in populations is most often undertaken using questionnaires as these are relatively inexpensive and easy to administer compared to objective measurement techniques.

In New Zealand, the New Zealand Physical Activity Questionnaire-Short Form (NZPAQ-SF) (Moy, Scragg, McLean, & Carr, 2008) (Appendix I) measured the frequency, intensity and duration of walking and moderate- and vigorous-intensity physical activity (Moy et al., 2008). It has been modified to reflect New Zealand culture. Individuals were required to recall the number of times over the past seven days they had spent briskly walking and in moderate or vigorous activity, as well as the usual amount of time spent per day doing these activities. Show cards were presented to participants as tools to help them describe the intensity of the various physical activities (Appendices, I & J). The NZPAQ-SF has also been used in national health surveys (Moy et al., 2008) and randomised controlled trials (Lawton et al., 2008; Maddison et

al., 2007). Furthermore, this questionnaire has been validated for Māori and New Zealand European by heart rate monitoring (Moy et al., 2008).

An important concept underpinning increased physical activity levels and eating healthy food is the self-efficacy of an individual (Bandura, 1977; Bandura & Locke, 2003). For those individuals newly diagnosed with T2DM a snapshot of their current perceptions about the importance of physical activity in managing and treating their condition was essential for addressing their level of readiness and for gaining an understanding of an individual with regard to their adoption of a healthy lifestyle. Hence, the reinforcement of the positive relationship between self-efficacy and specific health behaviours are expected to increase the time spent in, and the intensity of, physical activity, as well as increase the intention to exercise, improve attitudes and increase feelings of empowerment. Self-efficacy, which includes attitudes and feelings of empowerment, has been found to be pivotal in both forming intentions to exercise and to maintaining the exercise for an extended time (R.M. Anderson et al., 2009). Scales (questionnaires) developed by Anderson, Fitzgerald, Funnell, and Gruppen (1998) and Anderson, Funnell, Fitzgerald, and Marrero (2000), have been used to measure these aspects of self-efficacy. These scales were designed to assess the efficacy of the application of the theoretical frameworks for behavioural change and the development of optimistic and positive self-belief questionnaires. Three questionnaires for the scoring and measuring changes in the intention to exercise, attitudes to diabetes and the empowerment scale are described below.

First, an intention to exercise questionnaire (Schwarzer & Renner, 2000) is used to predict behavioural intentions of participants to carry out exercise when experiencing each of the following barriers: worries and problems; feelings of depression; tenseness;

other responsibilities or business (Appendix K). Second, the Diabetes Attitude Scale (DAS) (R. M. Anderson et al., 1998) (Appendices L, Ls), comprising thirty-three items measuring attitude change, is a valid measure of attitudes in people with diabetes. The reliability and validity of this tool has been tested in the United States (R. M. Anderson et al., 1998). Reliability (Cronbach alpha) of the five subscales ranged from 0.65 to 0.80 (see the methods section for more detail). The DAS tool was compared with earlier, longer versions of the scale and was found to have good content validity. The reliabilities of the subscales ranged from 0.65 (psychosocial impact of diabetes) to 0.80 (seriousness of T2DM mellitus). Third, the Diabetes Empowerment Scale–Short Form (DES-SF) questionnaire (Appendix M) measured psychosocial self-efficacy (R. M. Anderson et al., 2000). This tool has 28 items with an overall reliability score at 0.84. Sub-scores of: i) management of psychosocial aspects ( $\alpha = 0.93$ ); ii) readiness to change and dissatisfaction ( $\alpha = 0.81$ ); and iii) establishment and achievement of goals ( $\alpha = 0.91$ ) have also been shown to be reliable.

The previous two chapters have shown some evidence of improvement in engagement and active participation (Chapter 4) and positive changes in both physical and metabolic outcomes (Chapter 5). Another aim, explored in this chapter, was to better understand the association between changes in participant levels of physical activity and their perceptions of intent, attitude and empowerment to engage in physical activity at each time point along with biological changes.

## **6.2 Methods**

Briefly, the study compared Māori and New Zealand European and two modes of delivery of intervention, waea (telephone) and kanohi-ki-te-kanohi (face-to-face). For more details see the methods sections in Chapters 4 and 5.

At baseline, six months and 12 months, the participants completed all four questionnaires, being assisted by the interviewer (researcher) as necessary. All participants' responses from the physical activity questionnaires and diabetes specific self-efficacy and attitudinal scales were recorded on paper by the participants. These responses were checked by the researcher to ensure all questions had been answered; the raw scores were then tallied as per the rating scales criteria. For specific details see Appendices F to M. The individual raw and total scores were entered into an Excel <sup>TM</sup> spreadsheet by a third person as soon as possible after collection. The questionnaires administered, included:

1. *New Zealand Physical Activity Questionnaire* (Sport & Recreation New Zealand, 2008) has been designed to assess the time spent being physically active (brisk walking, moderate physical activity and vigorous physical activity) over the previous seven days (Appendix H). A list of descriptors were provided for the participant to select one that best represented the various physical activities that they had undertaken on an average week over the past six months (Appendices I and J) Table 6.1.
2. *Exercise Intention Scale* (Schwarzer & Renner, 2000) was used to predict behavioural intentions of the participants to carry out exercise when presented with the following barriers: worries and problems; feeling depressed; feeling tense; or busy. The response format was to select one of the following: 1 = not at all; 2 = with great difficulty; 3 = with some difficulty; 4 with little difficulty and; 5 very easily, for each of the potential barriers (Appendix K).
3. *Diabetes Attitude Survey (DAS-3)* is a general measure of diabetes-related attitudes administered to patients with diabetes and health care professionals.

The DAS-3 consists of 33 items and five discrete subscales. These subscales measure attitudes towards the following: i) need for special training to provide diabetes care; ii) seriousness of T2DM; iii) value of tight glucose control; iv) psychosocial impact of diabetes; and v) attitude toward patient autonomy. Each item has a five response Likert format which ranges from Strongly Agree = 5 to Strongly Disagree = 1 (Diabetes Research and Training Centre, 1998).

4. *The Diabetes Empowerment Scale – Short Form (DES-SF)* is designed to measure a patient's self-efficacy as a means of identifying attitudinal motivating and challenging factors in regard to engaging in physical activity. These subscales and items included managing the psychosocial aspects of diabetes, assessing dissatisfaction and readiness to change, and setting and achieving diabetes goals. The scale was scored by averaging the scores of all completed items (Strongly Disagree = 1, Strongly Agree = 5), (see Appendix M).

The individual scores and total scores were manually calculated for each questionnaire before being entered into the Excel<sup>TM</sup> spreadsheet and analysed. For each Likert scale question the responses were coded and entered as ordinal variables (score factors). All data (i.e. NZPA-SF, exercise intent, DAS, DES-SF) were fitted and then removed one-by-one on the significance test. For the modelling purposes, an independent mathematician iteratively checked residuals and identified any suspect data contributing to a right skew. Values were presented as mean change in score between baseline and six months and baseline and 12 months. All scores were then tested for significance and only those that were significant at the 95% CI were reported.

Table 6.1

*Assessment tools and scoring for questionnaires assessing physical activity, optimism and positive self-beliefs*

Assessment tool	Measure	Possible Range
NZPAQ-SF	Minutes spent walking/week	
	Minutes in moderate activity/week	
	Minutes in vigorous activity/week	
	Total minutes moderate plus vigorous x2/week	$\geq 150$ min is classified as active
Exercise intent	Composite score	1 to 5; 5 is best
Diabetes Attitude Survey	Patient Autonomy	1 to 5; 5 is worst
	Psychosocial Impact of T2DM	1 to 5; 5 is worst
	Value of Tight Control	1 to 5, 5 is worst
	Seriousness of T2DM	1 to 5, 5 is worst
Diabetes Empowerment Scale SF	Need for Special Training	1 to 5, 5 is worst
		1 to 5, 5 is best

### 6.2.1 Statistical analysis

Only the measurements for Māori and New Zealand European participants were evaluated at baseline, six months and 12 months. Descriptive statistics are reported as median and 25<sup>th</sup> and 75<sup>th</sup> percentiles. Prevalence of physical activity behaviours were reported as a percentage of those completing questionnaires. Kendall's coefficient of concordance,  $\kappa$ , a nonparametric test was used to determine if measures at baseline, six months and 12 months were different. For modelling the changes in the measures of the participants against their biological outcomes, an independent mathematician analysed the data using repeated measures of linear regression in lme package, R v2.12 software. The data were log transformed to compensate for the right skew in the residuals. The

Tukey adjusted multiple comparison procedure was used to compare different time points.

For possible explanations of changes in body weight between baseline and 12 months multiple linear regression was used to explore the influences of changes in NZPAQ minutes, exercise intent, DAS and DES. At first the null model was obtained by fitting all variables (changes in NZPAQ minutes, exercise intent, DAS and DES). The non-significant factors were removed stepwise based on a significance value  $>0.05$ . Each removed variable was then entered into the final model and the reduction in the variation within the residuals was tested to check for any interactions of the removed variables. None of the variables removed influenced the model significantly. This process of modelling was repeated for changes in waist circumference and then HbA1c.

## **6.3 Results**

### **6.3.1 Physical activity levels**

At baseline, the time spent in physical activity each week (i.e. total number of minutes) was low. Of the 150 participants who completed the baseline NZPAQ SF, more than one third (36%) reported that they had spent no time walking briskly in the last six months and 20% reported no time spent being physically active (moderate or vigorous) (Table 6.2 – 6.3). The majority of participants (90%) did not undertake the recommended 30 min per day of brisk walking on five or more days per week. In this GRx research study no significant differences in time and intensity of physical activity were seen between mode of delivery, kanohi-ki-te-kanohi (face-to-face) or waea (telephone), ethnicity or gender but there was a large inter-individual variation and the data was skewed to the left. Between baseline and six months the proportion of participants who were completely inactive (i.e. spent no time walking) halved (Table

6.3) and this was maintained at 12 months (Table 6.4). The proportion who reported no moderate activities increased from a third at baseline to one half at 12 months. A similar pattern of small changes was seen when all measurements at each time point were included in Table 6.2.

There was no significant change in total time of walking following treatment. All data were severely left-skewed because more than half of the participants (50%) reported very little activity. These participants would be classified as inactive using the cut-off criteria for inactivity of at least 150 min of moderate and weighted (x2) vigorous activity each week. Three out of ten participants spent no time walking briskly (Table 6.2) in the last week at the three measurement points. In contrast, there was a long right tail with a few (>10) participants who reported an excess of a 1000 min of activity a week. These participants had day jobs that required daily walking (and lifting) that the participant interpreted as time spent walking.

Overall, no significant differences in time and intensity of physical activity were found in the two modes of delivery, the two ethnic groups or gender at baseline or at six months or 12 months. At baseline there was a tendency for Māori men (Table 6.2) to report that they spent more time briskly walking than Māori women, and Māori men reported more time undertaking moderate intensity activities. In contrast, New Zealand European women tended to spend more time walking than New Zealand European men but the time spent in moderate activity was comparable. At six months approximately half of the participants (50%) reported that they spent 30 min/week or more walking, with a quarter (25%) of the New Zealand European men reporting walking more than five hours (330 min/wk) in a week (Table 6.3). At 12 months the overall activity

reported by the 57 participants was reduced, compared with six months (Table 6.4). For the most active (25%) the time spent in activity, including walking was increased.

### **6.3.2 Optimism and positive self-beliefs**

The intent to exercise, the DAS subscales and the DES showed no apparent change over the 12 months (Tables 6.2 - 6.4). Most participants indicated that there was some difficulty associated with their intentions to exercise at baseline. Three of the 57 participants questioned at 12 months had a decline in their score by a point or more, while only one improved their score. For DAS, a score of one is the most positive attitude possible in sub-domains and the median score was always 2.5 or above, with the majority of participants scoring above three (Tables 6.2 - 6.4). This indicated a tendency towards negative attitudes at baseline, which was followed through to six months and 12 months. No differences were observed in these trends over time by mode of delivery, ethnicity or gender. Similarly, with the empowerment scale there were no changes compared with baseline at six months and 12 months.

Table 6.2

*Baseline physical activity and psychometric measures*

	<b>Māori</b>		<b>New Zealand European</b>	
	Women	Men	Women	Men
	Median (Q <sub>1</sub> , Q <sub>3</sub> )	Median (Q <sub>1</sub> , Q <sub>3</sub> )	Median (Q <sub>1</sub> , Q <sub>3</sub> )	Median (Q <sub>1</sub> , Q <sub>3</sub> )
	(n=38)	(n=28)	(n=47)	(n=23)
<b>Physical Activity</b>				
Briskly walking (min/wk)	13 (0, 42)	20 (0, 40)	20 (0, 40)	10 (0, 30)
Moderate activity (min/wk)	75 (0, 540)	195 (0, 375)	90 (0, 180)	40 (0, 210)
Vigorous activity (min/wk)	0 (0, 0)	0 (0, 5)	0 (0, 0)	0 (0, 0)
Moderate + 2x vigorous (min/wk)	195 (0, 540)	210 (0, 540)	90 (10, 225)	140 (0, 210)
<b>Psychometric Measures</b>				
Exercise intent score	2.8 (2.4, 3.4)	3.0 (2.2, 3.8)	2.5 (1.9, 3.2)	3.2 (2.6, 3.8)
	[1.0, 4.2]	[1.0, 4.2]	[1.0, 4.2]	[1.4, 4.2]
Patient Autonomy (DAS)	3.7 (3.2, 4.0)	3.6 (3.3, 3.9)	3.8 (3.4, 4.0)	3.6 (3.3, 4.0)
	[2.5, 4.8]	[2.6, 4.3]	[2.4, 4.7]	[2.9, 4.7]
Psychosocial Impact of DM (DAS)	3.5 (3.2, 4.0)	3.7 (3.3, 4.0)	3.5 (3.2, 3.8)	3.7 (3.3, 3.8)
	[2.2, 4.5]	[2.7, 4.8]	[2.3, 4.8]	[2.8, 4.5]
Value of Tight Control (DAS)	3.0 (2.7, 3.4)	3.0 (2.7, 3.6)	3.0 (2.6, 3.3)	2.9 (2.7, 3.4)
	[2.0, 4.0]	[2.0, 4.7]	[2.1, 4.7]	[2.3, 4.1]
Seriousness of NIDDM (DAS)	2.9 (2.7, 3.0)	3.0 (2.9, 3.3)	2.9 (2.6, 3.1)	3.0 (2.6, 3.1)
	[1.9, 4.6]	[2.1, 4.4]	[2.0, 4.4]	[2.3, 4.3]
Need for Special Training (DAS)	4.2 (4.0, 4.6)	4.1 (3.8, 4.6)	4.4 (4.0, 4.6)	4.0 (3.8, 4.4)
	[2.8, 5.0]	[3.2, 5.0]	[3.0, 5.0]	[3.2, 5.0]
Diabetes Empowerment Scale-SF	4.1 (3.5, 4.2)	3.7 (3.4, 4.1)	3.8 (3.4, 4.0)	3. (3.2, 3.9)
	[2.2, 4.6]	[3.2, 4.6]	[2.3, 4.6]	[2.8, 4.6]

Data are presented as (Q<sub>1</sub> Q<sub>3</sub>), Q<sub>1</sub>, the 25th percentile; Q<sub>3</sub>, the 75th percentile; range [minimum, maximum]; n, number of participants; DM = Diabetes mellitus; NIDDM = Non-insulin dependent diabetes mellitus; DAS = Diabetes Attitudinal Scale; Diabetes Empowerment Scale-SF = Short Form; *n=80 out of 93 who had valid 6-month weight measures*

Table 6.3

*Six month physical activity and psychometric measures*

	<b>Māori</b>		<b>New Zealand European</b>	
	Women	Men	Women	Men
	Median (Q <sub>1</sub> , Q <sub>3</sub> )	Median (Q <sub>1</sub> , Q <sub>3</sub> )	Median (Q <sub>1</sub> , Q <sub>3</sub> )	Median (Q <sub>1</sub> , Q <sub>3</sub> )
	(n=19)	(n=13)	(n=34)	(n=14)
<b>Physical Activity</b>				
Briskly walking (min/wk)	30 (8, 33)	30 (16, 99)	30 (15, 60)	38 (16, 330)
Moderate activity (min/wk)	0 (0, 285)	90 (0, 225)	105 (0, 225)	90 (0, 427)
Vigorous activity (min/wk)	0 (0, 0)	0 (0, 0)	0 (0, 0)	0 (0, 0)
Moderate + 2x vigorous (min/wk)	0 (0, 480)	120 (0, 225)	140 (0, 360)	90 (0, 428)
<b>Psychometric Measures</b>				
Exercise intent score	3.2 (2.8, 3.7) [1.4, 4.4]	3.4 (2.9, 4.1) [2.4, 4.4]	2.8 (2.4, 3.6) [1.8, 4.4]	4.00 (2.8, 4.4) [2.2, 4.4]
Patient Autonomy (DAS)	3.8 (3.3, 4.3) [2.9, 5.0]	3.6 (3.3, 3.9) [1.5, 3.9]	3.9 (3.5, 4.1) [2.6, 4.8]	3.8 (3.1, 4.1) [2.9, 4.5]
Psychosocial Impact of DM (DAS)	3.7 (2.8, 4.0) [2.3, 4.5]	3.7 (3.3, 3.8) [1.5, 4.0]	3.6 (3.0, 3.8) [2.7, 4.8]	3.3 (3.0, 4.2) [2.2, 4.7]
Value of Tight Control (DAS)	2.9 (2.7, 3.6) [2.3, 4.6]	3.0 (2.7, 3.6) [1.4, 3.9]	2.9 (2.7, 3.3) [2.0, 3.0]	2.8 (2.5, 3.1) [1.6, 4.3]
Seriousness of NIDDM (DAS)	2.9 (2.7, 3.0) [2.3, 3.9]	3.0 (2.6, 3.6) [1.7, 4.0]	2.9 (2.6, 3.0) [2.1, 3.7]	3.0 (2.8, 3.2) [2.7, 4.3]
Need for Special Training (DAS)	4.4 (3.8, 4.8) [3.2, 5.0]	4.0 (4.0, 4.5) [1.6, 5.0]	4.5 (4.0, 4.8) [2.4, 5.0]	4.0 (3.4, 4.5) [1.4, 4.8]
Diabetes Empowerment Scale-SF (DES)	4.0 (3.67, 4.3) [3.2, 4.7]	4.1 (3.5, 4.6) [3.2, 4.7]	4.00 (3.6, 4.4) [1.0, 4.7]	4.2 (3.7, 4.7) [2.8, 4.7]

Data are presented as (Q<sub>1</sub> Q<sub>3</sub>), Q<sub>1</sub>, the 25th percentile; Q<sub>3</sub>, the 75th percentile; range [minimum, maximum]; n, number of participants; DM = Diabetes mellitus; NIDDM = Non-insulin dependent diabetes mellitus; DAS = Diabetes Attitudinal Scale; Diabetes Empowerment Scale-SF = Short Form; *n=80 out of 93 who had valid 6 month weight measures*

Table 6.4

*Twelve month physical activity psychometric measures*

	<b>Māori</b>		<b>New Zealand European</b>	
	Women	Men	Women	Men
	Median (Q <sub>1</sub> , Q <sub>3</sub> )	Median (Q <sub>1</sub> , Q <sub>3</sub> )	Median (Q <sub>1</sub> , Q <sub>3</sub> )	Median (Q <sub>1</sub> , Q <sub>3</sub> )
	(n=9)	(n=10)	(n=29)	(n=9)
<b>Physical Activity</b>				
Briskly walking (min/wk)	15 (3, 230)	35 (20, 2400)	20 (19, 40)	0 (0, 60)
Moderate activity (min/wk)	150 (15, 420)	60 (0, 1860)	0 (0, 150)	0 (0, 270)
Vigorous activity (min/wk)	40 (0, 120)	0 (0, 143)	0 (0, 0)	0 (0, 0)
Moderate + 2x vigorous (min/wk)	290 (45, 600)	120 (0, 3205)	0 (0, 218)	0 (0, 270)
<b>Psychometric Measures</b>				
Exercise intent Scores	3.3 (2.9, 4.4)	3.9 (3.0, 4.6)	3.0 (2.2, 3.6)	3.40 (2.90, 3.80)
	[2.6, 4.6]	[2.4, 4.6]	[2.0, 4.6]	[2.8, 4.6]
Patient Autonomy (DAS)	3.5 (3.4, 3.9)	3.4 (3.1, 3.9)	3.8 (3.4, 4.0)	3.63 (3.44, 4.00)
	[2.9, 4.1]	[3.0, 4.3]	[3.1, 4.4]	[3.1, 4.5]
Psychosocial Impact of DM (DAS)	3.7 (3.2, 3.7)	3.7 (3.3, 3.8)	3.3 (3.2, 3.8)	3.50 (3.08, 3.92)
	[2.8, 3.8]	[3.3, 4.3]	[2.5, 4.3]	[2.8, 4.3]
Value of Tight Control (DAS)	2.9 (2.6, 3.3)	3.1 (2.7, 3.6)	2.7 (2.5, 2.9)	2.71 (2.64, 3.64)
	[2.6, 3.6]	[2.4, 4.7]	[1.3, 3.4]	[2.6, 3.7]
Seriousness of NIDDM (DAS)	2.9 (2.6, 3.1)	3.1 (2.9, 3.3)	2.9 (2.6, 3.1)	3.14 (2.86, 3.36)
	[2.6, 3.3]	[2.6, 3.4]	[2.1, 3.7]	[2.7, 4.3]
Need for Special Training (DAS)	4.3 (4.0, 4.4)	4.0 (3.8, 4.5)	4.2 (3.8, 4.6)	4.20 (4.00, 4.60)
	[3.8, 4.8]	[3.0, 5.0]	[2.6, 5.0]	[4.0, 4.8]
Diabetes Empowerment Scale-SF	4.6 (3.9, 4.8)	4.3 (3.8, 4.5)	4.0 (3.7, 4.4)	3.89 (2.67, 4.50)
	[3.9, 4.8]	[3.7, 4.8]	[2.6, 4.8]	[1.9, 4.7]

Data are presented as (Q<sub>1</sub> Q<sub>3</sub>), Q<sub>1</sub>, the 25th percentile; Q<sub>3</sub>, the 75th percentile; range [minimum, maximum]; n, number of participants; DM = Diabetes mellitus; NIDDM = Non-insulin dependent diabetes mellitus; DAS = Diabetes Attitudinal Scale; Diabetes Empowerment Scale-SF = Short Form *n=57 out of 61 who had valid weight measures*

### 6.3.3 Optimism and positive self-beliefs; physical and metabolic measures

Changes in time spent in physical activities and optimism and positive self-belief scores were tested for any relationship with changes in body weight, waist circumference and HbA1c for the 37 participants who had body weight, waist circumference and HbA1c measured (Table 6.5) but only two were significant. For each unit increase in the diabetes empowerment score, body weight reduced by 2.6 kg (95% CI, 0.4 to 4.8). With each one unit decrease in the score for need for special training, waist circumference reduced by 2.9 cm (95% CI, -0.47 to 6.2).

Table 6.5

*Changes in body weight, waist circumference and HbA1c of 37 participants assessed between baseline, 6- month and 12-month time points*

	Time points compared	% difference	(95% CI )	p-value
Body weight	6 month - baseline	1.0	(2.3, -0.3)	0.16
	12 month - baseline	1.5	(2.9, 0.0)	0.046
	12 month – 6 month	0.5	(2.0, -1.0)	0.74
Waist circumference	6 month - baseline	3.0	(4.2, 1.8)	0.000
	12 month - baseline	4.1	(5.4, 2.8)	0.000
	12 month - 6 month	1.1	(2.5, -0.3)	0.15
HbA1c*	6 month - baseline	2.2	(5.7, -1.4)	0.32
	12 month - baseline	4.6	(8.0, 1.0)	0.007
	12 month - 6 month	2.4	(5.9, -1.2)	0.26

6-month - baseline - mean value of 6-month measurement divided by the mean of baseline,

If positive, denominator is larger by X%, if negative - Denominator is smaller by X%

Tukey adjusted p-value

\* Residual behaviour is not normal. Some pattern of increasing variance with time. The estimate may be inaccurate

## 6.4 Discussion

Any improvements and associations among reported physical activity, perceptions of intent, attitudes, empowerment and metabolic outcomes, were unclear or had no significant change in this analysis. There was no apparent decline in these factors either. The GRx research study cohort was particularly high risk; all participants had T2DM and most were classified as severely obese ( $\text{BMI} \geq 40 \text{ kg/m}^2$ ). That is, it was not surprising that physical activity levels were extremely low and many participants were completely inactive at the start of their GRx programme. There was some evidence that physical activity increased but, for many, there were no reported changes. No apparent change was found in the optimistic and positive self-belief measures associated with diabetes exercise intent, attitudes and feelings of empowerment. What may be considered as favourable was that these aspects - exercise intent, attitude and feelings of empowerment, did not deteriorate over the course of the GRx intervention. Often with the course of a chronic illness, such as diabetes, self-efficacy may deteriorate (Lustman, 1988; Lustman, Griffith, & Clouse, 1988). Moving against this trend, in the more complex analysis, there appeared to be an association between reductions in body weight with perceived empowerment and a reduced in waist circumference measurement with the reduced need for more professional help and support.

Five other GRx studies (Elley, Kerse, Arroll, et al., 2003; Foley et al., 2011; Kerse et al., 2005; Lawton et al., 2008; Swinburn, Walter, Arroll, et al., 1998) showed, as their main outcome measure, an increase in physical activity with modifications of the GRx and length of intervention (Table 6.6). However, the profile and health of their participants, the main outcome measures, the way the prescription was delivered and the tools for

measurement of physical activity varied (Table 6.6). Unlike the present GRx research study none of these studies measured metabolic outcomes or perceptions of optimism and positive self-belief or focused on Māori or those newly diagnosed with T2MD. More specific comparisons between the present research study and these five studies are explored below (Table 6.6). A comparison of the participant profile found that those participants in the present research study were less active (Table 6.2), possibly because their health profile showed they were heavier (presenting with a BMI of  $\geq 40 \text{ kg/m}^2$  rather than BMI of  $\leq 30 \text{ kg/m}^2$ ).

Moreover, delivery modes and time of the GRx intervention have changed markedly over the last 15 years. The first reports (Elley, Kerse, Arroll, et al., 2003; Kerse et al., 2005; Lawton et al., 2008; Swinburn, Walter, Arroll, et al., 1998) of effectiveness of the GRx health service focused on the initial role of the health professional; the general practitioner or nurse; in counseling and the motivational interviewing of the patient before referral for a physical activity programme from a Sports Trust or community group. More recently, the GRx modes of delivery have widened to include other ways of engagement and participation, including group and face-to-face interaction with a physical activity expert who was not part of the general practice. Self-referrals were also possible. Whereas, the Foley study allowed self-selection of intervention by support group or telephone (Foley et al., 2011), the current GRx research study examined the effect of randomisation to waea (telephone) or kanohi-ki-te kanohi (face-to-face) after referral by the health professional and signing for informed consent to take part in this GRx research study.

#### **6.4.1 Strengths and limitations**

In the process of informed consent no information was withheld from any participant about what the GRx health service, in either mode, was intended to achieve. Describing the intervention in detail before delivery was a feature of this GRx research study – the researcher had the role of explaining this to participants, not the health professional who may have been constrained by time. Furthermore, the participant received the waea (telephone) intervention whether they took part in the research or not. Although there was no control group in this GRs research study the fact that the waea (telephone) intervention was based on the national GRx health service in Aotearoa New Zealand can be argued to serve as the control group when compared with the kanohi-ki-te-kanohi (face-to-face) outcomes. Moreover, the current research study could be placed as a study that was compared with the implementation of other modified GRx health services, in which the national waea (telephone) intervention was also the control group. In addition, this was the first time that the association of self-belief with physical and metabolic changes, was explored. There was a limitation in that the tools used have not been validated for a New Zealand population or Māori. However, a recent review highlighted that no single measure can suit every purpose or application and, with careful consideration, appropriate measures can be selected and truly robust assessments undertaken successfully (Speight, Browne, & Furler, 2013; Speight, Reaney, & Barnard, 2009; Speight, Sinclair, Browne, Woodcock, & Bradley, 2013). Moreover, questions can be extracted from quality of life tools such as the Audit of Diabetes Dependent Quality of life (ADDQL) that specifically asked the participant to rate their quality of life living with, or without, diabetes (Bradley et al., 1999). Furthermore, for the Māori

assessment of health, it may be more appropriate through health modes that emphasised biological health with mental and/or emotional, spiritual and family well-being constructs aligned with the Whare Tapa Wha model (M. H. Durie, 1998b).

Table 6.6

*Comparisons of physical activity in the present GRx research study and five other studies*

Study	Design	N and ethnicity	Intervention	Main outcome	Actual measured change in physical activity	Limitations
<b>Swinburn, et. al., 1998</b>	RCT, two advice groups - written or verbal	n=465 sedentary men and women, aged 34 – 64 yr (mean, 49 yr). Ethnicity not reported.	GRx – written goal-oriented advice compared with verbal advice from a GP on physical activity over six weeks	Both treatments increased time spent in activity by ~50%, written advice marginally more than verbal.	Physical activity increased in both groups was in excess of one hour per week, with an average 2-week increase in duration	Number of days or sessions of physical activity over six weeks not reported.
<b>Elley, et. al., 2003</b>	Cluster RCT, control group (usual GRx – 3 months) and, intervention (Patients prompt their GP – three months).	n=878 sedentary men and women aged 40-79 yr, enrolled. Successful completers, n=750. Ethnicity not reported.	Patients prompt their GP to deliver GRx programme (oral or written advice).	Prompting the usual general practitioner for brief advice, couple with telephone support can improve self-rated variables including general health benefits for sedentary people..	Leisure time increased in intervention group by 34 more min/day than in control group. Baseline was 11 min/day	Study did not have sufficient statistical power. More research is needed to clarify the reasons behind sex differences in the success of failure or participating.
<b>Kerse, et. al., 2005</b>	Cluster RCT – post hoc subgroup analysis	n=270 women aged 65 yr and older. Ethnicity not reported.	GRx was written and activity goals set. Follow-up via telephone support over three months.	GRx in routine primary care will probably lead to health gain for older people.	Leisure time physical activity increased by 0.67/h/wk.	Self-reported physical outcomes may be subjective. Further research required to evaluate sustainability of GRx

<b>Lawton, et al., 2008</b>	RCT, control group (usual GRx – three months) and, intervention (GRx extended – nine months).	n=1089, relatively inactive women 40-74 year olds. Ethnicity not reported.	Brief physical activity intervention led by nurse with six month follow-up visit and monthly telephone support over nine months.	Increased physical activity and quality of life over two years	Increase from 10% achieving 150 min moderate physical activity a week at baseline to 39% in intervention compared with 33% in control	No true control group or number of sessions or days reported. Sample size not large enough to detect as significant any differences in clinical outcomes.
<b>Foley, et. al., 20011</b>	Evaluation – comparative process, cost and outcome evaluation of two GRx modes of delivery. One GRx contract holder in Auckland, NZ assessed.	n=5441 referred, (Māori; n=1431 (26.3%), NZE, n=1480 (27.2%). n=1735 registered (Māori, n=413, NZE, n=593). Successful completers, n=133 and n=45 for community and telephone support only reported.	Comparison of two GRx modes of delivery: Telephone support once a month over three months and community support via weekly face-to-face support group meetings.	Participants in community support self-reported a significantly greater number of days of exercise per week than those in phone.	Community support was 3.65 versus 2.66 days, 95% CI 0.30 to 1.70, p=0.006.	The number of sessions or days of support for either mode of delivery were not reported. The average number of min and unit costs per session were provided.
<b>Williams, 2013</b>	RCT, two GRx modes of delivery assessed. One Contract holder Sport Waikato, Hamilton, NZ	n=152 participants, near equal representation of adult Māori and NZE men and women.	Comparison of two GRx delivery modes waea (telephone) and kanohi-ki-te-kanohi (/face-to-face) assessed at baseline, 6 months and 12 months.	No apparent increase in physical activity either treatment. Initial kanohi-ki-te-kanohi contact important to engage participants, positive trends in improved physical activity levels and diet, physical and metabolic conditions, and self-efficacy.	At 6 months 50% of the participants reported that they spent 30 min a week or more walking and 25% of NZE men reported at least 330 min a week	No true control group. Hence, standard GRx provided -it would be unethical not to provide GRx.

The recommendation that arose from this analysis of the relationship among outcomes, while finding no apparent effect of different mode of delivery or ethnicity or gender, was that when a GRx was prescribed by a health professional there should be a mechanism to ensure that clearly the recipient understood that the prescription may work better than some drugs in improving their quality of life and health.

#### **6.4.2 Future research work**

Psychological variables make a unique and statistically significant contribution to the explanation of differences in physiological and emotional diabetes outcomes.

Potentially, modifications of personal views about diabetes could help promote positive health outcomes for people newly diagnosed with diabetes. The present GRx research study highlighted specific illness perceptions that could be targeted in future interventions. There were associations between a reduction in body weight with perceived empowerment and a reduction in waist circumference measurement with the reduced need for more professional help and support.

#### **6.4.3 Conclusions**

More understanding of how to improve health literacy (knowledge and understanding of their health profile) self-efficacy to achieve empowerment within a health service was necessary. In a vulnerable and hard-to-reach population, such as individuals newly diagnosed with T2DM, including Māori, health risk factors such as excess body weight, enlarged waist circumference and HbA1c, may be improved alongside changes in attitude and empowerment (aka self-efficacy). The challenge was now how to provide the most supportive environment within the health care and community resources available while not losing sight of the importance of human interaction.

## **Chapter 7 Perceptions, understandings and activities concerning the Green prescription health service**

### **7.1 Introduction**

The primary aim of this chapter was to better understand the perceptions, knowledge and activities of the participants newly diagnosed with T2DM that enabled them to engage in the GRx health service and their experiences with participating in the research; the viewpoints of the GP and/or practice nurse, in particular, their reasons for administering the GRx programme, including its potential use. In addition, retrospective comments from quarterly reports were prepared by the researcher and included a kaupapa Māori approach with the participants for all their interactions in the research study and the GRx health service. Research questions about how many, when and what physical, metabolic and behavioural changes were made, by delivery mode, ethnicity and methods were addressed in Chapters 4, 5 and 6, using quantitative measures and analysis. A need for this qualitative investigation was identified because of the underlying premise to better understand the perceptions, knowledge and activities of those individuals diagnosed with T2DM that enabled them to engage with the GRx health service. It was also important to understand how promoting regular physical activity and eating nutritious food is necessary to achieve the long term outcome of improved health gains in a population (Barbosa et al., 2011; Rush, Crook, et al., 2009). Therefore, this chapter focused on answering the broader research questions of why more Māori engaged or why they did not complete the GRx intervention (Chapter 4), why weight was lost and glycaemic control (HbA1C) improved (Chapter 5) and why some participants showed an improvement in their attitudes and empowerment (Chapter 6). This involved understanding how participants make and maintain lifestyle changes through

participating in the GRx health service. Understanding participants' changes in perception about physical and/or metabolic measures will be compared with each delivery mode, waea (telephone) or kanohi-ki-te-kanohi (face-to-face), and between Māori and New Zealand European.

## **7.2 Methods**

The research aim and questions were addressed using descriptive-interpretative design and tools (Tong, Sainsbury, & Craig, 2007) underpinned by an inquiry approach informed by general inductive theory (D.R Thomas, 2006). Data about how, why and what participant decisions were made and obtained through open ended and Likert scale questions using the semi-structured interview schedule (Appendix F), and prompts in the face-to-face interviews with the participants. In addition, discussions and meetings with the GRx kaiwhakahaere (facilitator) were minuted and, a letter sent to the GP and/or practice nurse for clinical information and any comments that they wished to make (Appendix Q).

The inquiry process involved kanohi-ki-te-kanohi (face-to-face) interviews by the researcher with each GRx participant to understand their perceptions, understanding and engagement with the GRx health service. This occurred at baseline (n=152), six months (n=88) and one year (n=76), hence a total of 316 interviews. Interviews were held primarily in the participants' homes or at alternate setting such as a workplace or marae. The researcher elicited information about; i) the meaning of the GRx experience to them; ii) changes and/or aspects that may or may not have motivated the participant to increase active participation in physical activity (and the adoption of eating nutritional food); and iii) change in knowledge about managing their blood glucose concentration. The pre-defined questions assisted the

participants to identify factors that facilitated or hindered the participant's use of the GRx health service. A number of participants also provided success stories (testimonials) as well as completing interviews with the researcher. One case study is shared as an example in this chapter, telling how the participant overcame her living with T2DM challenges by implementing the knowledge and instructions provided by the Māori GRx kaiwhakahaere and she reiterated the importance of kanohi-ki-te-kanohi (face-to-face) contact, feeling valued and rewarding one for their successes. The researcher, who has a background of four years' postgraduate studies in clinical psychology, took care to avoid influencing the participant responses, to listen actively and the responses recorded verbatim on paper. Quotes that are in reference to participants are represented in order of ethnicity, gender, treatment and time. Quotes that refer to the Māori GRx kaiwhakahaere (facilitator) are represented by XXX. Two Māori GRx kaiwhakahaere (facilitator) delivered the GRx programme over 12 months (13.08.09 to 03.08.10). The first Māori GRx kaiwhakahaere (facilitator) provided intensive one-one-one support for the first two months and the second Māori GRx kaiwhakahaere (facilitator) covered the remaining 10 months. Regular meetings with the researcher occurred at least once a month where notes of those meetings were scribed and/or minuted by the researcher. Of the number of GP and/or practice nurse evaluation letters designed to collect laboratory and clinical data including their comments about how the GRx health service helped their patients (or otherwise), 28 were completed out of 152 sent. Both Māori GRx kaiwhakahaere (facilitator) retained contractual positions at Sport Waikato Regional Sports Trust beyond this GRx research study. The results or responses from the participants, Māori GRx kaiwhakahaere (facilitator) and GPs and/or practice nurses are presented in this order, in the current GRx research study.

### **7.2.1. Transcribing, condensation and coding**

Excel spreadsheets were used to code and sort responses into themes that had been subjectively determined by the researcher during the processes of transcription, while also checking the source material for accuracy and undertaking the iterative reading of the participants' responses and narratives of their experiences relating to the GRx health service. As the data were collected, broad groupings of information and the participant's progress were identified by the researcher from observation and discussion with the data entry person (at weekly intervals), with the Māori GRx kaiwhakahaere (facilitator), at fortnightly intervals and, the research reference team, at monthly meetings. Furthermore, statements were selected from these data sources by the research team and were reported to the Ministry of Health Aotearoa New Zealand in quarterly reports. In addition, specific examples of success stories were presented in a booklet, as part of the contractual responsibility of Sport Waikato to the Ministry of Health Aotearoa New Zealand.

At the conclusion of the overall data collection, the researcher undertook further iterative readings of the transcripts of the interview conversations underpinned by a general inductive theory approach to develop the key themes (D.R Thomas, 2006). Selected and relevant portions of the text were again classified and grouped into broad themes, which were initially determined from the prompts in the interview schedule. The final themes derived allowed the selection of quotes to highlight the participant's perceptions, context and understanding of the GRx programme they received. The participant perceptions were then followed by the Māori GRx kaiwhakahaere, GP and/or practice nurse responses.

## **7.3 Results (Findings)**

Of the 152 participants interviewed at baseline, 46% were Māori, 44% were

New Zealand European and 10% were categorised in to the 'Other' group. Sixty-three per cent of the participants said that they did not understand what was required in the GRx health service even though they had been referred by their GP and/or practice nurse. Nearly 32% of the participants understood that the GRx was a health opportunity to get fit and a means of receiving help to manage their diabetes through physical activity, while 23% were clear about the intent and commitment required in the GRx health service. All but two participants agreed to be audio-taped. The majority of the participants appeared whakama (shy) or did not like to hear the sound of their voices. Subsequently, the researcher wrote notes and summarised this information at the end of each session. The researcher then showed and discussed the summary of the interview with each participant. Furthermore, no participants requested or required copies of the notes for personal use.

### **7.3.1 Thematic analysis**

The transcripts of the interviews were analysed thematically using a general inductive approach to understand overall experiences, enablers and barriers for both participant and health professionals (D.R Thomas, 2006). Each transcript was read several times to identify themes, the inductive component. Emerging themes were identified from the participant responses to each open ended question in the interview schedule. In each question the researcher looked for common patterns (i.e., overall experiences, enablers and barriers in the GRx health service). Common patterns were sorted into three themes for each question. The researcher then looked at all the themes across the questions as a whole to identify key general themes. Words and/or phrases were colour coded that related to affect, behaviour and cognition for the transcripts that were completed at baseline, 6-month and 12 months.

This coding approach was designed to obtain a better understanding or position of the participants and health professionals.

### **7.3.1.1 Participant responses: their views and perceptions**

Five overall themes were identified (Table 7.1).

Table 7.1

*Themes underpinning participants responses*

<b>Whānaungātanga:</b> strengthening relationships kanohi-ki-te-kanohi (face-to-face)	The participants, researcher and Māori GRx kaiwhakahaere (facilitator) established rapport in the initial interview. The relationship strengthened based on mutual trust and understanding; participant responses strongly indicated that kanohi-ki-te-kanohi (face-to-face) was the preferred mode to engender rapport
<b>Pātaka mātauranga:</b> sharing knowledge leads to increased understanding and, responsibility	A greater understanding of how physical activity and eating patterns can positively impact on the participants level of wellness, coupled with a more active lifestyle, and their overall perception of wellness increased
<b>Whakamana:</b> empowerment	The role of the Māori GRx kaiwhakahaere in facilitating the GRx service was critical to motivating participants to set personal goals, and motivating them to become more active and make sustainable changes to their eating habits. The overall goal was to enhance the mana of the participants, the Māori GRx kaiwhakahaere, the research team, and the researcher as well as add value to the GRx health service.

<b>Manaakitanga:</b> giving and receiving support and assistance from others	Participants acknowledged that the support from others helped motivate and sustain their efforts, whether the support was from family, GRx social groups, or community networks
<b>Pikitia ngā maunga:</b> overcoming barriers	Identifying ways to overcome existing and perceived barriers affected how well the participant was able to achieve their goals

***Whakawhānaungātanga: strengthening relationships kanohi-ki-te-kanohi (face-to-face)***

The initial kanohi-ki-te-kanohi (face-to-face) contact was reported to be critical for the process of whānaungātanga (strengthening relationships) between the participants, the researcher and the Māori GRx kaiwhakahaere (facilitator).

Engagement and active participation is illustrated in the following quotes:

*“The first face-to-face contact with the researcher was what hooked me into this research.” (Māori man, 59 yr, waea)*

*“Seeing XXX (researcher) before getting GRx and then the XXX (GRx kaiwhakahaere) helped me to start. I wanted to start because they explained it (GRx process) to me face-to-face. If I didn’t meet the girls I would not have done this programme.” (‘Other’ man, 70 yr, kanohi-ki-te-kanohi).*

Participants added that if given a choice of which GRx mode of delivery to participate in, the preference was to receive kanohi-ki-te-kanohi (face-to-face) rather than waea (telephone). Kanohi-ki-te-kanohi (face-to-face) mode of delivery was affirmed to be more personal and helpful because responses could be attended to directly. However, for those participants who received the waea (telephone) delivery it did not deter them from receiving their telephone calls from the Māori GRx kaiwhakahaere (facilitator). Furthermore, a mixed mode of delivery for the GRx health service was also recommended.

*“Knowing XXX is going to ring me was motivating, however, if given a choice I would have preferred XXX to come to my home/kainga.” (Māori man, 49 yr, waea)*

*“Face-to-face visits have helped me to do physical activity. I know if I received the telephone support it would not be good. It's nice to hear and share, it's important to see the person. Compliments about my physical appearance were good too - you can't do/get that over the phone.” (NZE woman, 38 yr, kanohi-ki-te-kanohi)*

*“My eyesight is failing. Therefore, it would be best if someone came and showed me what to do vs. telephone support. I found XXX very friendly-enjoyed talking to her. I guess the telephone support helps a little because it gives me encouragement and I feel good afterwards. ... It would be good just to see the person I am talking to at least once. This just gives me an idea of who I am talking to. Having the researcher explain the research to me face-to-face didn't make me worry so much about telephone call from XXX.” (NZE woman, 78 yr, waea)*

*“I liked the GRx, it is personal. It's like someone is really interested in you. I would prefer face-to-face versus telephone, but a mix of both would also work.” (NZE man, 74 yr, waea)*

***Pātaka mātauranga: sharing knowledge leads to increased understanding and responsibility***

The participants reported that they had greater control of their diabetes through gaining knowledge about physical activity and nutritious food for achieving optimal blood glucose control. These participants also credited the information (advice) and resources (i.e. physical activity home circuit and diabetes food booklet) provided by the Māori GRx kaiwhakahaere (facilitator) for increasing their knowledge and understanding about the importance of physical activity and eating nutritious food.

Such an awareness led participants to take responsibility in how to implement their newly-acquired knowledge and understanding by increasing the amount of physical activity and consumption of nutritious food so as to reduce diabetic-related complications.

*“Information given like the home circuit, diary and the food booklet was useful to learn about ways of managing my diabetes such as what types of food I could eat, and. XXX spoke to me about the resources.” (NZE man, 76 yr, kanohi-ki-te-kanohi).*

*“People are helping with me with good advice, and keep in touch with me over the telephone.” (NZE woman, 62 yr waea).*

*“It (GRx) was access to some support - mentioning physical activity to me raised my awareness about it (GRx), and then I was able to ask questions especially to my GRx programme.” (Māori man, 61 yr, waea)*

*“I think the combining of doing and learning with the information given has helped to increase my knowledge about physical activity, food and medical advice about diabetes and, has strengthened my ways to manage my diabetes.” (Māori woman, 51 yr, kanohi-ki-te-kanohi, 12 months)*

***Whakamana and manaakitanga: support can lead to empowerment/self-efficacy***

Furthermore, participants reported that progression through their individualised GRx programme was initiated through advice and guidance from the Māori GRx kaiwhakahaere (facilitator), together with support from their significant others (e.g. partners/spouse, children or grandchildren or family as a whole).

*“I have a plan, it's something that keeps me going and having someone, XXX, to give me a little push encourages me to be active with my exercises.” (NZE man, 80 yr, kanohi-ki-te-kanohi)*

*“I am happy that this GRx and XXX helped me to increase and maintain better physical activity and healthy eating.” (Māori woman, 48 yr, kanohi-ki-te-kanohi)*

*“Walking with my partner and swimming with a friend and being told I no longer need metformin was a great feeling.” (NZE woman, 52 yr, waea)*

*“I felt really good and enjoyed swimming (6-7 lengths on my own) XXX would keep an eye on me. I really enjoyed swimming because I felt fitter and, had lots of support. ... Whānau recognise me out at the moana (ocean/sea) this is good because they are happy to see me collecting kai moana (sea food).” (Māori man, 62 year, kanohi-ki-te-kanohi).*

Participants visually seeing improvements in their physical and metabolic measures at each time point reported it underpinned their commitment and confidence to continue with achieving their goals, and reflecting on what they had achieved:

*“When I first met you, walking to the shop seemed like miles away, and now it's like nothing, before I realise it, I'm there. I walk at least four days a week from zero.” (Māori women, 62 yr, waea)*

*“My puku (stomach) is smaller, I have more energy and I'm more aware on how to control my blood sugar levels, good kai (food) and exercise...” (Māori man, 48 yr, kanohi-ki-te-kanohi)*

*“I feel good about myself, I've actually lost weight. When I could see on paper my medical results (e.g. BP and glucose) were changing these kept me going. Reward myself for achieving.” (Māori man, 49 yr, waea)*

*“Losing weight was a big encouragement. I feel better. ... I can move better now that I've done this (GRx). I would have preferred to have seen the person. I would recommend f2f then they can see. Hands on is the best to do things, for example, physical activity.” (NZE man, 57 yr, waea)*

### ***Pikitia ngā maunga: overcoming barriers***

When overcoming barriers the participant must first recognise what those barriers or triggers might be. Seventy-one barriers were identified and recorded (Table 7.4).

The majority (59/71) of the participant barriers related to physical, medical, psychological or motivational factors. While changes in the participants' work, study or family situations, as well as the cost to enter physical activity programmes, prevented them from participating at the intensity level agreed to, these changes did not appear to be recognised as significant barriers. Despite support from the Māori GRx kaiwhakahaere (facilitator), factors not related to the delivery of GRx were identified by participants as significant barriers to achieving GRx goals, for example:

*“I am doing less due to moving house, I also know that I do not have to slog and I know that more of the shorter walks vs. longer are less stress. An example is walking to bus stop.” (NZE woman, 50 yr, kanohi-ki-te-kanohi)*

*“I first started keen, increased cycling per day and exercise and walking but exercised less often as time progressed due to academic commitments.”  
(Māori man, 46 yr, kanohi-ki-te-kanohi)*

*“I started off well re. getting on the treadmill regular but then stopped due to kidney stones.” (NZE man, 59 yr, waea)*

*“The cost of getting to Gallagher’s pool on Wednesday and, after Friday was a barrier for me. (Māori women, 50 yr, waea)*

Table 7.2

*Types of barriers reported by both Māori and New Zealand European participants and the GRx kai whakahaere (facilitator) at both six months and 12 months*

Types of barriers	Number
<b>Physical/Medical</b>	
Injury to hips, feet, & legs	8
Chronic medical condition problems/hospitalisation	7
Skin infections	1
Arthritis	3
Illness/sick	2
Medication	1
Excess weight - limits how far I can walk	2
<b>Environmental</b>	
Seasonal (winter is too cold and summer is too hot to engage in outdoor physical activities)	2
Swimming - travel and entry costs to swimming pool facility	2
Swimming - increase times/sessions	2
<b>Personal</b>	
Academic milestones	2
Employment (shift work)	2
Relocation	1
Family responsibilities (e.g. looking after mokopuna/grandchildren)	1
<b>Psychological (motivational)</b>	
Prefer kanohi-ki-te-kanohi vs. waea	26
Downsizing food portions	1
More regular contact & follow-up – programme ends	7
Swimming – getting dressed in front of others	1
<b>Total</b>	<b>71</b>

*Note.* Responses include Māori and New Zealand European; Kanohi-ki-te-kanohi = face-to-face and waea = telephone

### 7.3.2 Māori GRx kaiwhakahaere (facilitator): their perspective

Retrospective information was collected from the Māori GRx kaiwhakahaere (facilitator) documented in Ministry of Health quarterly reports (see the methods section for more detail) to elicit their key perspectives. This section reiterates the themes found in the participant interviews and are briefly presented below.

#### *Whakawhānaungātanga: strengthening relationships kanohi-ki-te-kanohi (face-to-face)*

Whakawhānaungātanga (embracing or establishing relationships) was established by each Māori GRx kaiwhakahaere (facilitator) with the participants after the informed consent interview with the researcher. Each of the two Māori GRx kaiwhakahaere (facilitator) reported that their first interaction was much easier than the usual GRx health service contact because the participants appeared generally positive about participating in the GRx health service research trial from the interview with the researcher. The Māori GRx kaiwhakahaere (facilitator) added that being part of the research process and being responsible for delivering the GRx health service strengthened their understanding of the GRx health service, and improved their working relationships with the participants, work colleagues and research team; in particular, it guided their practices and provided an opportunity to share their experiences during the scheduled meetings. Furthermore, the Māori GRx kaiwhakahaere (facilitator) reported that they ultimately did this mahi (work) because they had the passion for people, and they confirmed that throughout the research they worked to the best of their ability.

***Pātaka mātauranga: sharing knowledge leads to increased understanding and responsibility***

The Māori GRx kaiwhakahaere (facilitator) provided participants with individual physical activity programmes (e.g. walking with friends at lunch time or going to the park with their children) to assist the participants with their individual self-care programmes within their natural settings. Participants reported to the Māori GRx kaiwhakahaere (facilitator) that the most popular or widely used resources were the diary for physical activity and food, the home circuit, and learning about what physical activities they could do at home or in their community. Each Māori GRx kaiwhakahaere (facilitator) reiterated the participants' comments about what resources were helpful in managing their diabetes medical complaints:

***Whakamana and manaakitanga: support can lead to empowerment***

A third theme was to emphasise trends associated with setting, achieving and improving their health goals. The Māori GRx kaiwhakahaere (facilitator) reported it was important for them and the participant to first recognise potential barriers, to set goals to overcome that/those barrier(s), and to then celebrate successes through achieving the set goals. It was rewarding for the Māori GRx kaiwhakahaere (facilitator) to see participants gain control over their goals, which appeared to reinforce participants in engaging and actively participating in their GRx programme. Moreover, the Māori GRx kaiwhakahaere (facilitator) added that, in comparison to their experience of working with participants in the national 3-month waea (telephone) GRx health service, the 6-month GRx health service enabled the opportunity to develop better relationships with participants, in particular, having a stronger role in guiding and tailoring goals to the participant's needs (i.e. increasing

the frequency, intensity and duration of an activity or exercise) was achieved. One example was that of showing a participant how to raise her knee while ascending a hill to ease the workload, while another was arranging shorts and t-shirts for participants to engage in aqua jogging classes at a local public swimming pool as a result of participants explaining how *whakama* (shy) they were to participate in pool activities. In addition, it was reported by the Māori GRx kaiwhakahaere (facilitator) that their ultimate goal was to affirm their role as a mentor and to take responsibility for guiding the participants in an informed way to manage their blood glucose levels. However, for the Māori GRx kaiwhakahaere (facilitator), comments about witnessing *the glow or shine* in a participant's face reinforced the participant towards becoming empowered through achieving their lifestyle goals.

#### ***Pikitia ngā maunga: overcoming barriers***

According to the Māori GRx kaiwhakahaere (facilitator), challenges that were associated with waea (telephone) delivery, were mainly about the less personal experience where it was difficult to see any signs of interest or how well the participant was able to perform the activity and, therefore, it was difficult to gauge the level of success. The reported preference of the Māori GRx kaiwhakahaere (facilitator) was to be animated, using their hands and/or body to explain and show participants how to do the activity or exercise agreed upon, as would have been demonstrated in the kanohi-ki-te-kanohi (face-to-face) mode of delivery. Alternately, the Māori GRx kaiwhakahaere identified that those participants who enjoyed the telephone communication, talked endlessly about their GRx programme. Advantages reported by the Māori GRx kaiwhakahaere (facilitator) of the waea (telephone) delivery mode was that it was generally less expensive because petrol

costs were minimised and the use of their time was not compromised if participants were not at their home as arranged. Conversely, costs associated with travelling to a participant's home and, on arrival, finding they were not home impacted the Māori GRx kaiwhakahaere (facilitator's) travel time and travel costs.

### **7.3.3 Medical professionals: their perspectives**

A total of 28/152 evaluation forms (Appendix, Q) distributed were returned completed from the medical professionals (i.e. GP and/or practice nurse). Although the number of responses was disappointing, the information was analysed alongside the results from interviewing the GRx participants and the Māori GRx kaiwhakahaere (facilitator). Seventy five percent of the GP respondents reported that they were undecided about how the GRx health service had helped their patients to increase participation in physical activity and to eat nutritious food. Their responses identified that the limited engagement with the GRx health service was associated with patient mobility, reduced visits to their GP/medical centre, and their lack of readiness to participate in the GRx health service. The remaining 25% of GP respondents reported that their patients increased their physical activity as a result of the GRx health service. A proportion (29%) of the GP respondents reported that they did not know or were unsure about whether the GRx helped their patients to increase their daily physical activity and/or whether it encouraged the eating of healthy food, as addressed below. Although 75% of the GP respondents were ambivalent about the overall positive effects of the GRx health service, 71% of them had some favourable comments about how the GRx health service worked for their patients in relation to weight loss and a reduction in HbA1c, from 11.9% to 9.2%. Only 6/28 respondents provided information about what motivated or did not motivate their patients to participate in the GRx health service. For them, terminal

illness, hospitalisation and delays in access to staff at Sport Waikato impacted on how well they perceived their patients participated in the GRx health service.

One of the strengths of this body of work was the increased understanding provided by a number of participants who provided testimonials of success. One success story is shared as an example below.

#### **7.3.4 Case Study: success story**

Kuia is a term of respect for an elderly Māori woman and is often used as a first name. For this reason, I have used the pseudonym *Kuia* in this case study. Kuia is a Māori woman aged 60, living away from her immediate family. At the first interview with the researcher, Kuia reported feelings of wariness and was reluctant to participate. She agreed because her GP and/or practice nurse had advised her to attend. Kuia had spoken to the researcher over the telephone. She said, *“Your voice told me you could speak te reo – Māori (Māori language), this made me feel OK – let’s see what she has to say.”* Kuia added, *“I did not know what to expect, and not knowing increased my resistance to participate in the GRx programme in this study.”*

At that time, Kuia stated that she was feeling *mamae* (hurt or pain) and *pouri* (sadness) for her son and his family because he was in a near fatal accident and receiving intensive care at a hospital located in a different area, far from where she lived. It was then important for the researcher to allow Kuia time to *korero* (talk), to express her fears and concerns, to answer Kuia’s questions about T2DM, and to share information about the GRx research study. Subsequently, Kuia relaxed, signed the consent form, and completed the questionnaires. During the interview Kuia knew her responses were about her thoughts and that she wasn’t being judged. That is, there was no right or wrong answer. During the interview she reported that she had heard that others newly diagnosed with T2DM also struggled with managing

their blood glucose levels through physical activity and diet. This knowledge reportedly allayed her fears about participating in the present GRx research study. She was prepared to participate in the research study and wanted to inform others about how the GRx health service impacted on her life. At 12 months, Kuia participated in the interview and was positive about the improvements indicated by comparing the physical and biochemical results, and was very positive about the GRx health services overall, in particular, the kanohi-ki-te-kanohi mode of delivery, as evidenced by her comments:

*“Downsizing my food – less sugar, and going to the pool at least 3x a week helped with the consistent and encouraging support from XXX.”*

*“You know I feel like I’m 18 years old again. I can walk with my mokopuna (grandson) to his school now, and spend time with him while he rides his bike at the park – this is great!”*

*“For me kanohi-ki-te-kanohi is important as it shows that your company cares, like they really care.”*

Kuia’s active participation in the GRx health service from the first kanohi-ki-te-kanohi (face-to-face) interview was reportedly a positive experience. By the 12-month interview, the time Kuia spent in brisk walking increased nearly three-fold (Table 8.1). Her physical (i.e. body weight, waist circumference) and metabolic (i.e. HbA1c, total/HDL cholesterol ratio and triglycerides) measures had reduced. There was no apparent change over the 12 months in the Diabetes Attitudinal Scale subscales, but there was improvement in the Exercise Intent Scale and Diabetes Empowerment scales completed by Kuia. In real terms, between baseline and 12 months, Kuia’s body weight reduced by 17.1 kg, her waist circumference dropped by

21 cm and she had a reduction in HbA1c of 2.1 mmol/L. These changes were well above the average physical and metabolic changes for those participants in the present study and other local GRx studies (Dalziel et al., 2006; Elley, Kenealy, Robinson, & Drury, 2008; Kerse et al., 2005). Coupled with her responses during the interview, this was indicative of an increase in her optimism and positive self-beliefs. Initially, Kuia demonstrated some resistance to participating in the GRx health service but the outcomes she achieved were very positive. The increased levels in physical activity, improvements in physical and metabolic measures, and changes in the attitude scales indicated she has made progress towards improving her health and lifestyle. A further indication of success of Kuia's experience within the GRx health service in this research study was that she agreed for her personal experience to be made public. This was not anticipated after her initial reluctance at the engagement interview. Furthermore, Kuia added that when she completed the 6-month intervention with the GRx Māori kaiwhakahaere (facilitator) she then joined a koeke (Māori elders group) hosted by a Māori health provider to continue with her physical activity and eating healthy food regime.

Table 7.3  
Physical, metabolic and questionnaire measures for Kuini

		Baseline	6 months	12 months
<b>Physical</b>	Body weight (kg)	106.0	103.4	88.9
	Waist circumference (cm)	129.0	126.0	108.0
	Systolic BP (mmHg)	146	146	137
	Diastolic BP (mmHg)	80	78	80
<b>Metabolic</b>	[HbA1c] (%)	12.7	11.4	10.6
	[High density lipoprotein] (mmol/L)	1.32	1.10	1.04
	[Total cholesterol] (mmol/L)	4.6	4.6	3.5
	[Triglycerides] (mmol/L)	1.4	1.4	0.7
<b>Questionnaires</b>	Physical activity (min/wk)	0	120	420
	Exercise Intent Score	2.8	3.8	4.6
	Patient Autonomy (DAS)	3.6	3.6	3.5
	Psychosocial Impact of DM (DAS)	3.8	3.3	3.7
	Value of Tight Control (DAS)	3.0	2.7	2.6
	Seriousness of NIDDM (DAS)	2.9	2.9	2.9
	Need for Special Training (DAS)	3.8	3.2	4.0
	Diabetes Empowerment Scale	3.4	4.3	4.6

DM = Diabetes mellitus; NIDDM = Non-insulin dependent diabetes mellitus; DAS = Diabetes Attitudinal Scale

## 7.4 Discussion

A major finding was that, overall, the participants (both Māori and New Zealand European) knew little about the GRx health service even though they had been referred by their GP and/or practice nurse. Five key themes were identified in

relation to diabetes self-care associated with T2DM. It was identified that the participants, the researcher and Māori GRx kaiwhakahaere, including the participant GP and/or practice nurse, were all responsible for imparting knowledge in strengthening their relationships to overcome potential barriers in the patient self-care plan through one-on-one support.

***Whakawhānaungātanga: strengthening relationships kanohi-ki-te-kanohi (face-to face)***

Overall, the participants reported that if given a choice of a GRx mode of delivery programme their preference would be GRx kanohi-ki-te-kanohi (face-to-face) rather than waea (telephone). When working with participants, kanohi-ki-te-kanohi (face-to-face) contact was described as an efficient communication style, as it can help solve incentive problems; it can facilitate socialisation and learning; and it provided psychological motivation (Hudson et al., 2008, 2010; Miller & Rollnick, 2009, 2012; G. H. Smith, 2001) for Māori and New Zealand European alike. Obtaining informed consent is a critical point of any research, as has previously been reported, and was evidenced in the present GRx research study (Pringle, 2008; Simmons & Voyle, 2003; Williams et al., 2009). Similarly, Inzucchi et al (2013) added that the provision of effective care was about being respectful of, and responsive to, individual patient/participants' preferences, needs and values, and that the care was guided by clinical evidence.

***Pātaka mātauranga: sharing knowledge leads to increased understanding and, responsibility***

Living with T2DM required the individual to develop a range of skills and knowledge to take greater control of their health and well-being. In the present

research study, progression through the GRx health service was tracked by participants who kept records of how often they did the activity (e.g. walking, swimming or dancing) including the intensity (e.g. distance and rates) and the duration (i.e. length or time period), as prescribed in other GRx lifestyle interventions (Elley, Kerse, Arroll, et al., 2003). Confidence in the research team was sustained throughout this GRx research study because participants received information that was accurate and easy to understand. Incorporating behavioural change theories has, reportedly, had a wide appeal for facilitating the development and implementation of healthful interventions (Clark et al., 2004; Corser et al., 2007; Miller & Rollnick, 2012). Similar to kaupapa Māori research methods and bicultural principles, an important feature was sharing knowledge, but equally important was to share knowledge that would target increased physical activity and eating healthy food. For some participants, such knowledge helped to alleviate any worries or concerns they had about managing their T2DM and associated risks factors. When this knowledge was applied the majority of participants reported being more physically active and eating more healthy food options. In other studies (Woods, 2011) resources about nutrition were reported to have positive effects on behaviour (Umpierre et al., 2011). Subsequently, participants reported feeling healthy because behavioural changes were evident, such as reported increases in physical activity and increased consumption of nutritious food. These practices were seen to promote knowledge acquisition, skill building, and self-efficacy of individuals, in general (Miller & Rollnick, 2012).

***Whakamana and manaakitanga: support can lead to empowerment/self-efficacy***

Personalised one-on-one advice and interaction from the Māori GRx kaiwhakahaere (facilitator) with the participants appeared to motivate them to engage with, and

achieve, their goals associated with physical activity and food security actions. An ability to set specific activity goals related to increasing physical activity and consumption of healthy food was a treatment focus (Inzucchi et al., 2012). Small achievable goals were set to meet larger goals, by the participant with the support of the Māori GRx kaiwhakahaere (facilitator). A shared respect resulted between the Māori GRx kaiwhakahaere (facilitator) and the participant evidenced by participants imitating physical activities modelled by the Māori GRx kaiwhakahaere (facilitator) in their natural settings (e.g. home, workplace or marae) through the application of motivational interviewing skills (Hecht et al., 2005; Miller & Rollnick, 2012). Keeping records of how often they (the participants) did their activity (e.g. walking, swimming or dancing) including their intensity (e.g. distance and rates) and duration (i.e. length or time period) in that activity were deemed as useful when the intensive support was removed. Other GRx studies and/or surveys conveyed the use of recording tools as a positive influence related to patients/participants successfully achieving progress with their lifestyle changes (Aikaterini et al., 2013; Elley, Kerse, Arroll, et al., 2003). Lastly, there was some agreement that education about health, nutrition and physical activity by the Māori GRx kaiwhakahaere (facilitator) who identified as Māori, or supported Māori culture, could be beneficial.

### ***Pikitia ngā maunga: overcoming barriers***

Individuals referred to GRx are generally in poor health and led sedentary lifestyles and had been diagnosed with a range of medical conditions (Elley et al., 2004; M. Johnson & Wood, 2013; Pringle, 2008); the participants in the present reproduced a similar profile. For the participants a lack of knowledge about access to health services, a lack of understanding about managing blood glucose and lipid levels, and the inability to pay for the associated costs have been reported as challenges in the

present research study, which were reiterated by the Māori GRx kaiwhakahaere and as identified in other reports and/or studies (Baxter, 2002; M. Johnson & Wood, 2013; Lustman et al., 1988; van Aalst & Daly, 2004). Barriers reported by the GPs and practice nurses were more related to participants being hospitalised due to medical complaints. However, a more pressing concern identified in the present GRx research study is that so few GPs and practice nurses returned completed forms indicating a lack of interest and, perhaps, the reason for a small uptake of participants in the present GRx research study. Other studies have provided evidence that hard to reach, not through isolation, but because of attitudinal, physical and psychological barriers also impact on how well an individual can improve their health related risks associated with T2DM (Lillis et al., 2008). In response to resolving such barriers some local GRx reports and studies (Pringle, 2008; Simmons & Voyle, 2003; Williams et al., 2009) recommend that GRx health services that include Māori participants would potentially be more successful if the Māori GRx kaiwhakahaere (facilitator) visited Māori GRx participants in person, kanohi-ki-te-kanohi (face-to-face). Although kanohi-ki-te-kanohi (face-to-face) interaction may be preferred, it may also be perceived as introducing bias into the data collected (Wyatt, 1986). However, from the Māori GRx kaiwhakahaere perspective it is the kanohi-ki-te-kanohi (face-to-face) interaction that provides the animation required to demonstrate how to achieve set goals and it also provides the ability to re-frame the context should a question be misperceived or misunderstood. Therefore it gives the opportunity for the Māori GRx kaiwhakahaere to follow up on responses of interest in greater depth, which cannot be achieved in a waea (telephone) or impersonal questionnaire approach. A further concern reported by some of the participants, was that the strategy of counselling over the waea (telephone) was less helpful as they

viewed it as less personal. Hence, the likelihood of participants reverting from showing some intent to improve their physical activity and consumption of nutritious food behaviour through the GRx health service may move to no intent to engage in the GRx health programme overall. Moving between the stages of change and/or relapse is notably common in the constructs of the trans-theoretical model (Prochaska & DiClemente, 1992).

Moreover, three months was considered insufficient to enable connections to be made through sharing of accurate knowledge and then understanding the newly acquired information by the Māori GRx kaiwhakahaere (facilitator), while the participants reported that they would have preferred ongoing support beyond the six months. These findings add support for Pringle's (2008) recommendation to lengthen the national GRx health service from three months to six months. However, there were mixed reviews about when the best time for improved physical and metabolic measures occurs, but there seemed to be a consensus that the best positive outcome was between the first six months to 12 months of diagnosis (Anonymous & American Diabetes, 2013; Dale, Williams, & Bowyer, 2012; Rush, Freitas, et al., 2009). Unfortunately, the least responsive group, those participants who did not complete the GRx intervention and those GPs and practice nurses who did not return the completed questionnaire forms were, indicatively, the very group that would have been useful to interview. It is their stories that would provide insight into ways to maintain their motivation to engage and participate in the present GRx research study GRx health service and, possibly, others. Moreover the Māori GRx kaiwhakahaere (facilitator) did not hinder the New Zealand European participants and, as expected, they were well received by the Māori participants. The main point

was that each participant felt valued through the personalised contact in their natural setting, regardless of which mode of delivery was received.

#### **7.4.1 Conclusion**

In conclusion, the participants and health professional responses add insight to the GRx health service. Kanohi-ki-te-kanohi (face-to-face) was reportedly preferred, even though no differences in biological or physical outcomes were found. The need for kanohi-ki-te-kanohi (face-to-face) interaction, without overburdening health service, was important. Furthermore raising potential patients'/participants' knowledge is necessary for making lifestyle changes in the GRx health service. Community groups and use of strength of whanau (family) was imperative for successful health services.

## Chapter 8 General Discussion

In the present body of work, intensive (one-on-one) physical activity support and nutritional advice in a modified GRx health service achieved improvements in both glycaemic control and anthropometric measures in adult participants newly diagnosed with T2DM. The key focus of this thesis was about recruitment and engagement of a population (cohort) that typically did not participate in the GRx health service, and/or randomised trials. Insights into why and how these improvements occurred were provided through an analysis of questionnaires and descriptive-interpretive interviews. Participants were identified as extremely high risk for cardiovascular disease, with an average BMI of  $\sim 40 \text{ kg/m}^2$  (Table 5.1), and were inactive in that they engaged in fewer than 150 min of moderate activity per week (World Health Organisation, 2010).

This kaupapa Māori GRx research study, which used mixed methods for the investigation, has provided new knowledge to inform a better understanding of ways to increase Māori engagement and adherence with the GRx health service. It was known that very few (<4%) Māori actively engaged and participated in the national GRx health service (M. Johnson & Wood, 2013; Pringle, 2008; Swinburn, Walter, Arroll, et al., 1998). Furthermore, the prevalence of T2DM is increasing and is three-fold higher in Māori than New Zealand European (Damin et al., 2010). For many years it has been known that there was a need to better understand ways to engage and increase Māori participation possibly through the inclusion of kaupapa Māori methods, but little has changed.

*“All New Zealanders should have access to fair opportunities to participate in physical activity regardless of gender, age, race, socio-economic status, ability or geographic location.” (Hillary Commission, 1998).*

What differentiates the way the GRx was delivered in this research study was the inclusion of an initial kanohi-ki-te-kanohi (face-to-face) interaction for Māori and New Zealand European before the intervention started. This resulted in a GRx research study and intervention with equal numbers of each ethnic group at baseline (Figure 4.1). Māori recruitment and engagement in the current GRx research study was higher than in other evaluative reports associated with GRx lifestyle interventions in Aotearoa New Zealand (Elley, Kerse, & Arroll, 2003; Foley et al., 2011; Kerse et al., 2005; Lawton et al., 2008; Swinburn, Walter, Arroll, et al., 1998).

More New Zealand European (74%) stayed in the GRx research study at six months than Māori (51%), while at the 12-month follow-up 56% of New Zealand European and 30% of Māori were available for interview (Figure 4.1). There were double the number of women who participated than men in the present GRx research study; yet the ratio of men who actively participated was higher than the rates for men participating in other mixed gender studies (Elley, Kerse, Arroll, et al., 2003; Foley et al., 2011). However, it was not clear why more women than men participated in this GRx research study. In other studies women appeared to more often report the need for social support such as friends, co-workers, or those with common life circumstances (e.g. high risk mothers with preschoolers) to advance in their diabetes prevention and/or management programmes (T. G. Pavey, A. H. Taylor, et al., 2011; Svetkey et al., 2008).

In the present GRx research study, the participants also reported a preference for kanohi-ki-te-kanohi (face-to-face) interaction and this was supported by the Māori GRx kaiwhakahare (facilitator) interview. The advice and support provided by the Māori GRx kaiwhakahaere (facilitator) during the GRx health service, in which a social commitment and obligation (e.g. “I knew the facilitator was going to call and visit”) presumably motivated the participant to engage through a sense of belonging (“I prefer to walk with my husband and/or friends”) and entertainment (“XXX taught me how to move to music, this was fun”). Furthermore, motivation of the participants was maintained by a common cause (“I am here for my mokopuna and children, we are in it together”) along with the companionship of others to achieve their set lifestyle goals. It was very clear from the participants and Māori GRx kaiwhakahare (facilitator) responses that the inclusion of a kanohi-ki-te-kanohi (face-to-face) style of interaction was perceived to be important for reaching and engaging Māori, and that would also not disadvantage New Zealand European in future GRx health services. It can also be argued that the inclusion of a kanohi-ki-te-kanohi (face-to-face) approach created a fairer opportunity for Māori to participate in the GRx health service along with New Zealand European. The views of the GPs and practice nurses about mode of delivery preference were vague and their response rate to the GP letter and evaluation forms was low. Alternately this raises the question was the GP or nurse invitation to participate in the GRx service presented in a way that informed the participant adequately to make an informed choice?

From baseline through six to 12 months there was a decline in participation. There were two main reasons for not being invited into the GRx research study at baseline. These

were inaccurate information on GRx prescriptions from GP teams about the participant's diagnosis and incorrect contact details. The decline in numbers from baseline to six months was not surprising, and was similar in relation to other lifestyle randomised controlled trials (Holman, Paul, Bethel, Matthews, & Neil, 2008; Holman, Paul, Bethel, Neil, et al., 2008; T. G. Pavey, A. H. Taylor, et al., 2011; The Look Ahead Research Group, 2013). Follow-up at the 12 months was purely for the trial and the removal of the one-to-one monthly support made it more difficult to keep track of participants. It has been identified that the presence of social support increases motivation to participate in lifestyle interventions (Dale et al., 2012; Rush, Scragg, et al., 2009; Wing et al., 2013). Wing et al., (2006) added that social groups and one-on-one interactions were consistently shown to be effective for weight loss and maintenance for individuals diagnosed with T2DM.

Although participants in the present GRx research study were larger and heavier than those in other studies, the physical and metabolic changes were modest or small. The body weight reduction during the present research study was small (2 kg) along with small reductions of waist circumference (5.4 cm), and HbA1c (1%) at six months (Table 5.3). One possible explanation for these smaller changes may relate to the modest increase in physical activity levels achieved by participants (Tables 6.2-6.4). An alternative explanation is that some participants were on medications which may have promoted body weight gain to confound effects of the physical activity programme. Medications were recorded when possible but were not included in the analysis as the data was missing for many. Management for T2DM differs from prevention but both include physical activity and nutrition interventions.

In the Finnish Diabetes Prevention Study the intervention programme was most intensive in the first year and the changes in clinical characteristics were most substantial after the first year (Lindstrom et al., 2003; Lindström & Uusitupa, 2008). That is, the intervention goals to reduce body weight; reduce dietary and saturated fat, and increase physical activity and dietary fibre, improved more in the intervention group. Those in the intervention group received additional individual dietary counselling from a nutritionist and were offered circuit-type resistance training sessions and advised to increase their overall physical activity. In contrast, the control group received general dietary and exercise advice at baseline and had an annual physician's examination (Lindström & Uusitupa, 2008). However, these authors added that maintenance of the body weight reduction after the one year intensive one-on-one intervention period advocated that a less intensive one-on-one lifestyle intervention approach to weight reduction diet might be a more cost efficient way to manage overweight individuals (Lindstrom et al., 2003), and could also be considered for the present research study.

A prominent finding, in the present GRx research study, was a reduction in HbA1c of 1%, which is indicative of functionally-improved blood glucose control. Improved blood glucose control has been identified to further reduce specific risk factors such as dyslipidemia, hypertension, hypercoagulability, obesity and insulin resistance in short and long term studies (Dale et al., 2012; Rush, Chhichhia, Hinckson, & Nabiryo, 2009; UK Prospective Diabetes Study (UKPDS) Group, 1998). It could be noted that the dietary component of GRx, which emphasised consumption of low glycemic foods, complimented the physical activity changes to assist with blood glucose control (Boulé, Haddad, Kenny, Wells, & Sigal, 2001; Dale et al., 2012).

The frequency, duration, and intensity of leisure time and lifestyle physical activity during the 6-month intervention and follow-up at 12 months were estimated by the research study participants (Table 6.2). It was clear that daily life activities such as family commitments, injury and hospitalisation and relocation rated highly as perceived barriers for engaging in active participation in the present research study (Table 7.2). Such barriers made it difficult for the participants in the present research study to prioritise their involvement in the GRx health service. Other barriers depended on the general health and well-being of the participants and the level of physical activity each could undertake. The main physical activities, such as walking and swimming (usually associated with the outdoors), and the six month duration in this GRx research study, could impact on the frequency and duration of participants' walks and swimming activities. Ethnic and cultural preferences for food and physical activities need to also be considered in any intervention design. That is, dry and warm weather could encourage participants to walk or swim more often or for longer periods, whereas colder or more variable conditions could cause them to walk or swim less often and for shorter periods. Since it was not possible to control the weather the provision of indoor settings to continue with physical activities was a priority in lifestyle programmes, and was also achieved in the present GRx research study. That is, the Māori GRx kaiwhakahaere (facilitator) in the present research study provided information and resources (e.g. home circuit plan and diabetes food booklet) to increase the participant's knowledge and awareness of ways to maintain their individual programmes at a minimal cost and time commitment. Hence, understanding of how to improve health literacy and self-belief within a health service was necessary. Beyond the home setting, a new challenge is how

to provide the most supportive environment within the health care and community resources available and to not lose sight of the importance of the human interaction.

#### 8.1.1 **Strengths and limitations: overall evaluation**

The present body of work has several strengths. This included achieving a near equal representation of Māori and New Zealand European women and men who were newly diagnosed with T2DM in the research study. Individuals aged 60 years or more represented a particularly *ready for change* subgroup for translational programmes because their barriers (or perceptions of barriers) may be lower in that they were retired or relatively family-independent. It was also the first GRx research study to compare differences between the GRx delivery mode of kanohi-ki-te-kanohi (face-to-face) and waea (telephone). A range of outcome measures including physical metabolic health, and lifestyle behaviours were collected from participants that included observations from the GRx kaiwhakahaere (facilitator) and general practitioner. These observational methods were interpreted immediately and highlighted positive trends such as body weight and waist circumference reductions. These physical reductions were associated with important changes of HbA1c concentration at six months that persisted to 12 months (Figure 5.2). On the other hand the inclusion of the large number of repeated interviews with the descriptive interpretative analysis has added rich detail and context to the understanding provided in this thesis about the GRx health service.

There were several limitations within this GRx research study. In real life terms, GPs and/or practice nurses do not appear to have the same luxury of time to explain and encourage their patients to attend GRx programmes. These ideas are supported by comments made by the participants in relation to not knowing what the GRx programme

entailed (Chapter 7). Furthermore, the researcher was not always certain who was enrolled because she did not have control of recruitment. This resulted in misunderstandings in relation to recruitment management that had to be resolved by the researcher (Chapter 4). A number of 'Other' ethnicity who did not meet the criteria for the present GRx research study were recruited, consent obtained and all measurements made. This created extra work and reduced the size of the sample that was eventually achieved. Strategies such as early consultation with GPs and Māori/Iwi Health Providers were put in place to capture as many participants as possible for this study. Despite these attempts the original goal of recruiting 240 participants fell short of 88 participants (i.e., 37% short). In consequence, the present GRx research study was underpowered.

Another limitation was that while participants received information about nutritious food through the diabetes food booklet and diary as well as the option to attend a food label shopping trip that was offered in the latter stages (visit Number 5) of the intervention, dietary knowledge or change was not assessed. For future research it is suggested that a food frequency questionnaire or 24-hour dietary recall be assessed to see what is the usual amount and type of food consumed by an individual participant (Malik, Pan, Willett, & Hu, 2013). The participants in the present GRx research study, however, provided subjective responses (Chapter 7) about improvements in their diet through keeping the food diary and following ideas in the diabetes food booklet. Some of the changes that underpinned the metabolic improvement may include diet reduction in sedentary behaviours and the influence of medication. These were not measured. Physical activity was assessed by self-report questionnaire, but the data was not easy to

interpret and may be unreliable. If there had been the resource accelerometry at baseline, six months and 12 months this would have provided objective, reliable and accurate measures of intensity, frequency and duration.

Cost-effective analyses were outside the scope of the present GRx research study but should be undertaken for all research associated with translation of evidence into public health practice. Compared to waea (telephone) the kanohi-ki-te-kanohi (face-to-face) intervention had increased costs of time and travel for the Māori GRx kaiwhakahare. Yet the effect was not different. However, future cost-effective analysis may also consider the differential costs of the targeted inclusion of waea (telephone), kanohi-ki-te-kanohi and web mode of deliveries in order to reach a wider spectrum of potential individuals diagnosed with T2DM and other associated chronic diseases, such as cardiovascular disease.

#### **8.1.2 Future research work**

This body of work has laid a foundation and personal interpretation of what could work with Māori to ensure more effective engagement within the standard GRx health service. Group interventions held at settings of choice (e.g., marae or hapu and/or iwi premises) may have some benefit in the form of social support and would probably be more cost-efficient than the one-on-one clinical setting. This would remove the need for a motivational interviewing-based intervention, which is time consuming and requires skilled staff. Cost analysis of group interventions should be considered as Aotearoa New Zealand continues to have fewer resources for health care, the population ages and what would be ideal was not possible. Ways of reaching people newly diagnosed with T2DM has been seen to be the responsibility of the Aotearoa New Zealand health

workforce, in particular, Māori community health workers with Māori patients (Mane, 2009; Ministry of Health, 2012b; Simmons et al., 2008). Given there was also an increasing number of people diagnosed with T2DM below the age of 30 yr, an additional approach may incorporate training incentives designed to build the capacities of community health or whānau ora (family/whānau-centred services) workers. Such an approach may provide the necessary evidence for ways to meet the poor health status of Māori and the clear demand for improved health services, in partnerships with communities. To build and reinforce networks, communicate and share vision is all about working together within the community, this is a life course approach, empowering individuals and group Hauora (health and well-being).

### 8.1.3 Conclusion

The GRx as delivered in this intervention was associated with comparable improvements in HbA1c and weight for Māori and New Zealand Europeans with no difference between the two modes of delivery. Kanohi-ki-te-kanohi (face-to-face) contact was the preferred and appreciated approach to GRx. The unique principle behind the kanohi-ki-te-kanohi (face-to-face) contact was the application of kaupapa Māori approaches that facilitate sharing and translation of information into everyday activities. Understanding of GRx was poor prior to the initial contact. Participation by Māori once referred was relatively high and probably higher than New Zealand Europeans, but more barriers to participation were reported. The major hurdle to GRx uptake among Māori appears to be in primary care. Primary care needs to improve their explanation of GRx and their linkages with the GRx programme. New strategies are required to maintain participation. Looking to the future it is important for Aotearoa

New Zealand communities that an emphasis is on prevention rather than management and has an intergenerational approach. I shall conclude with a whakatauki symbolic of collaborative working relationships towards achieving health aspirations.

Nā tō rourou, nā taku rourou ka ora ai te iwi

With your food basket and my food basket the people will thrive  
(reduce inequality)

He aha te mea nui o te ao?

What is the most important thing in the world?

He tangata! He tangata! He tangata!

It is people! It is people! It is people!

(Children of today are parents tomorrow)

## Chapter 9 References

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## Chapter 10 **Appendices**

## Appendix A: Measurement definitions

Measurement definitions: Part 1, body mass index classification; Part 2, waist circumference and Part 3, metabolic syndrome.

### Part 1. World Health Organisation principal BMI classification cut-off points for adults

WHO Classification	BMI (kg/m <sup>2</sup> )	Risk of health conditions
Underweight	<18.50	Low risk
Normal range	18.50-24.99	Average risk
Overweight	25.00-29.99	Increased risk
Obese	≥30	Substantially increased risk
Obese (class I)	30.00-34.99	Moderate risk
Obese (class II)	35.00-39.99	Severe risk
Obese (class III)	≥40	Very severe risk

*Source:* Adapted from World Health Organisation 2000

### BMI body mass index

#### Part 2: Waist circumference cut-off points for adults aged 18 years and over

Risk of metabolic complications	Men	Women
Average risk	< 94 cm	< 80 cm
Increased risk	94–101 cm	80–87 cm
Substantially increased risk	≥ 102 cm	≥ 88 cm

**Part 3.** The International Diabetes Federation (IDF) definition of the metabolic syndrome

Central obesity (defined as waist circumference  $\geq 94$ cm for Europid men and  $\geq 80$  cm for Europid women, with ethnicity specific values for other groups)

Plus any two of the following four factors:

*raised TG level:*  $\geq 150$  mg/dL (1.7 mmol/L), or specific treatment for this lipid abnormality

*reduced HDL cholesterol:*  $\geq 40$  mg/dL (1.0 mmol/L) in males and  $< 50$  mg/DL (1.3 mmol/L) in females, or specific treatment for this lipid abnormality

*raised blood pressure:* systolic BP  $\geq 130$  or diastolic BP  $\geq 85$  mm Hg, or treatment of previously diagnosed hypertension

*raised fasting plasma glucose (FPG)*  $\geq 100$  mg/dL (5.6 mmol/L), or previously diagnosed Type 2 diabetes

If above 5.6 mmol/L or 100 mg/dL, OGTT is strongly recommended but is not necessary to define presence of the syndrome

## **Appendix B: Advisory group**

An advisory group was formed to oversee the running of this study. The advisory group comprised of Professor Elaine Rush & Dr. Simeon Cairns (School of Sport & Recreation, Faculty of Health and Environmental Sciences, AUT), Professor David Simmons (Cambridge University Hospitals NHS Foundation Trust, Cambridge, England), Dr Nic Crook (Lakes District Health Board Diabetes Services), Stephanie McLennan, Zoe Blair and Amiria McGarvery (Sport Waikato), Morehu Te Whare (Ngati Maniapoto Kaumatua) and Eru George (Pouherenga, Māori Health, Lakes District Health Board), Grace Joshy (Waikato Clinical School, University of Auckland), Dr Richard Pringle (Department of Sport & Leisure, School of Education, the University of Waikato) and the researcher. Waikato District Health Board teams (Te Puna Hauora Māori Health Runanga on behalf of the Iwi Māori Council, Diabetes Services, Pathlab, & Te Wai o Rona: Diabetes Prevention Strategy Kaitiaki Roopu) and New Zealand Diabetes Services (Murray Dear).

## **Appendix C: Green prescription manual**

Green Prescription working manual can be provided upon request to the researcher.

The table of contents in the working manual includes:

Forward

Introduction

Design of the Randomised Trial

Recruitment Processes

Data Storage

Advisory Group

Intervention

Location

Ethical Considerations

Key stakeholder roles and intervention guidelines

Guideline recruitment & intervention flow chart

Cover letter

Information Sheet

Consent forms

Questionnaires (GRx script, in-depth interview schedule, New Zealand Physical Activity Questionnaire, NZPAQ-Short Form, Show cards, Physical Activity Questionnaire, Diabetes Empowerment Scale and scoring key, Diabetes Attitude Survey and Questionnaire [includes biological measurements])

Anthropometry measurement instructions (Height, body weight, waist/girth and blood pressure)

GRx modes of delivery (waea/telephone or kanohi-ki-te-kanohi/face-to-face) over six months

## Appendix D: Questionnaire Instructions

### General instructions for administering questionnaires

- ✓ Write clearly
- ✓ Ensure correct spelling of all names - is it one word or two?
- ✓ Check the Unique Identifier Code is on **ALL** pages
- ✓ Has the consent form been signed?
- ✓ Are they able to undertake the six minute walk test?
- ✓ Questionnaire Order#:
  1. Green prescription script
  2. Interview schedule
  3. New Zealand physical activity questionnaire – Short Form (V1)
  4. Physical activity questionnaire (Stanford Patient Education Research Centre)
  5. Diabetes empowerment scale-short form (DES\_SF) (University of Michigan Diabetes Research)
  6. Diabetes attitude questionnaire and survey (University of Michigan Diabetes Research)

\*NB The above five questionnaires/surveys have been identified as the key tools to be administered to participants due to time constraints.

## Appendix E: Green prescription script

### Diabetes Research

Te Kōngoa Kōkiri

## Green Prescription

---

Patient's name

Address

Phone  DOB

Ethnicity ☐ NZ Maori ☐ NZ Euro ☐ PI ☐ Asian ☐ Other

Preferred time to call ☐ morning ☐ afternoon ☐ evening

---

Medical Conditions (tick all that apply)

☐ Type 2 Diabetes

☐ Asthma / respiratory

☐ High BP

☐ High Cholesterol

☐ Heart problems

☐ Arthritis

☐ Other

---

Weight

Fasting Lipids  Chol  LDL  HDL  Total HDL

Trigs

Resting Heart Rate

Blood Pressure

BMI

---

GP Judgment: Please assess your patients glucose control

☐ Stable: Well controlled

☐ Variable: Usually well controlled

☐ Unstable: Not well controlled

---

Name: Dr or nurse

Signed


Referrers address

Phone


Fax

Date

GRx is a health initiative of



supported by



www.sparc.org.nz

\*by signing, I confirm that I have explained the GRx process to my patient and advised them that their details will be passed to their local GRx support person who will provide them with advice and support.

Patient copy

Fax to 07 838 2655

For help and advice call 0800 ACTIVE 22 84 83

## **Appendix F: In-depth interview schedule**

Research Title:

What makes people living with diabetes increase their uptake of physical activity?

### Interview Questions

1. What does the Green Prescription model mean to you?
2. Can you tell me if you have participated in a Green Prescription model different to that in this study?
3. If yes, was the other Green Prescription model different to this Green Prescription model, if so, in what ways was it different?
4. Were there similarities between the Green Prescription model in this study and the other model? If so, in what ways was it similar?
5. What is different about the amount of physical activity you did before starting the Green Prescription model and, now?
6. Alternately, what are some of the key experiences in the Green Prescription model within this study that helped you to start and continue with physical activity?
7. What are some of the key experiences in the Green Prescription model within this study that did not help you to continue with physical activity?

8. If you could make changes to the Green Prescription model within this study what would you change, and, why?
9. On a scale from 1 to 5 please rate how strongly you agree or disagree that the Green Prescription model within this study helped you to increase and/or maintain your participation in physical activities. *(Circle the number/rating that best applies to you)*

1	2	3	4	5
Strongly	Disagree	Neutral		Strongly

10. In general, what are your thoughts about the Green Prescription model in this study?
11. Tell me what you would change about the Green Prescription model within this study and why?
12. On a scale from 1 to 5 please rate how strongly you agree or disagree that this Green Prescription model within this study will help/helped to increase your knowledge about ways to prevent/treat Type 2 diabetes. *(Circle the number/rating that best applies to you)*

1	2	3	4	5
Strongly	Disagree	Neutral		Strongly

**Appendix G: New Zealand Physical Activity Questionnaire – Short Form (V.1)**  
**Interviewer Instructions**

1. Administer the questionnaire only by face-to-face interview.
2. Do not use with children (<15 years).
3. Use translations when necessary (so far, Tongan and Samoan versions are available – please request these from Ministry of Health or SPARC if needed).
4. Note the start time for the interview in the box provided.
5. Begin with introductory statements, and then proceed with the questionnaire, following the routing of questions as appropriate and showing the respondent the relevant show-card at the appropriate times.
6. Give the respondent the time they need to think about each question and formulate their response.
7. If the respondent requests clarification of a question, first read the question again. Then if clarification is still needed, try to use definitions or examples provided in the questionnaire and the show-cards.
8. Once the interview has been completed, note the finishing time in the box provided (this is likely to be longer for older people, less educated people and those for whom English is a second language).
9. Also note (in the Notes box provided) if the information is possibly unreliable, together with reason for this (e.g. lack of rapport, English is second language, cognitive defect, hearing/ speaking/communicating difficulty, lack of relevance (i.e., severe mobility disability).

## **Appendix H: New Zealand physical activity questionnaire – Short Form (Version 1)**

‘I am going to ask you about the time you spent being physically active in the last seven days, from last xxx to yesterday. Do not include activity undertaken today. By ‘active’ I mean doing anything using your muscles. ‘Think about activities at work, school or home, getting from place to place, and any activities you did for exercise, sport, recreation or leisure. ‘I will ask you separately about brisk walking, moderate activities, and vigorous activities.’

Start Time: \_\_\_\_\_

Ask questions 1–7 (8 is optional)

### **Walking**

1. During the last seven days, on how many days did you *walk at a brisk pace* – a brisk pace is a pace at which you are breathing harder than normal? This includes walking at work or school, while getting from place to place, at home, and at any activities that you did solely for recreation, sport, exercise or leisure.

Think *only* about brisk walking done for at least 10 minutes at a time.

\_\_\_\_\_ days per week (GO TO 2) None (GO TO 3)

2. How much time did you typically spend walking at a brisk pace on each of those days?

\_\_\_\_\_ hours \_\_\_\_\_ minutes

### Moderate physical activity

3. During the last seven days, on how many days did you do moderate physical activities?

‘Moderate’ activities make you breathe harder than normal, but only a little – like carrying light loads, bicycling at a regular pace, or other activities like those on this card (*Show Card 1 – Moderate Physical Activity*). Do not include walking of any kind.

Think *only* about those physical activities done for at least 10 minutes at a time.

\_\_\_\_\_ days per week (GO TO 4) None (GO TO 5)

4. How much time did you typically spend on each of those days doing moderate physical activities?

\_\_\_\_\_ hours \_\_\_\_\_ minutes

### Vigorous physical activity

5. During the last seven days, on how many days did you do vigorous physical activities?

‘Vigorous’ activities make you breathe a lot harder than normal (‘huff and puff’) – like heavy lifting, digging, aerobics, fast bicycling, or other activities like those shown on this card

(*Show Card 2 – Vigorous Physical Activity*)?

Think *only* about those physical activities done for at least 10 minutes at a time.

\_\_\_\_\_ days per week (GO TO 6) None (GO TO 7)

6. How much time did you typically spend on each of those days doing vigorous physical activities?

\_\_\_\_\_ hours \_\_\_\_\_ minutes

#### Frequency of Activity

7. Thinking about all your activities over the last seven days (including brisk walking), on how many days did you engage in:

- At least 30 minutes of moderate activity (including brisk walking) that made you breathe a little harder than normal, OR
- At least 15 minutes of vigorous activity that made you breathe a lot harder than normal ('huff and puff')?

\_\_\_\_\_ days per week

None

#### Stage of Change

Note: This question is optional

8. Describe your regular physical activity over the past six months. Regular physical activity means at least 15 minutes of vigorous activity (makes you 'huff and puff') or 30 minutes of moderate activity (makes you breathe slightly harder than normal) each day for five or more days each week. Include brisk walking.

- I am not regularly physically active and do not intend to be so in the next six months
- I am not regularly physically active but am thinking about starting in the next six months
- I do some physical activity but not enough to meet the description of regular physical activity
- I am regularly physically active but only began in the last six months
- I am regularly physically active and have been so for longer than six months

Finish Time:

Notes:

---

---

---

## **Appendix I: NZPAQ - Short Form Show-card 1**

### Moderate Physical Activity

- Badminton (social)
- Ballroom dancing
- Bowls (indoor, outdoor/lawn)
- Carrying light loads
- Cricket (outdoors – batting and bowling)
- Cycling (recreational – less than 15 km/hr – not mountain biking)
- Deer hunting
- Doubles tennis
- Electrical work
- Exercising at home (not gym)
- Farming
- Golf
- Heavy gardening (digging, weeding, raking, planting, pruning, clearing section)
- Heavy cleaning (sweeping, cleaning windows, moving furniture)
- Horse riding/equestrian
- House renovation
- Kapa haka practice
- Kayaking – slow
- Lawn mowing (manual mower )
- Machine tooling (operating lathe, punch press, drilling, welding)
- Plastering
- Plumbing
- Skate boarding
- Surfing/body boarding
- Yachting/sailing/dingy sailing
- Waiata-a-ringā

## **Appendix J: NZPAQ - Short Form Show-card 2**

### **Vigorous Physical Activity**

- Aqua Aerobics
- Athletics (track and field)
- Badminton (competitive)
- Basketball
- Boxing
- Carrying heavy loads
- Chopping or sawing wood
- Cricket – indoors (batting and bowling)
- Cycling – recreational (not mountain biking) – more than 15 km/hr
- Digging ditches
- Exercise classes / going to the gym (other than for aerobics) / weight training
- Forestry
- Haka
- Heavy construction
- Hockey
- Judo, karate, other martial arts
- Kayaking – fast
- Mountain biking
- Netball
- Rock climbing
- Rowing Cycling – competitive
- Rugby League
- Rugby Union
- Race walking
- Running/jogging/cross country
- Singles tennis/Squash
- Skiing
- Soccer
- Softball (running and pitching only)
- Surf life saving
- Table tennis (competitive)
- Taiaha
- Touch rugby
- Tramping Swimming – competitive
- Triathlon Water polo
- Volleyball

## Appendix K: Exercise intent questionnaire

Name:

“How certain are you that you could overcome the following barriers?”

I manage to carry out my exercise intentions:

1 ... even when I have worries and problems

1	2	3	4	5
---	---	---	---	---

2 ... even when I feel depressed

1	2	3	4	5
---	---	---	---	---

3 ... even when I feel tense

1	2	3	4	5
---	---	---	---	---

4 ... even when I am busy

1	2	3	4	5
---	---	---	---	---

The wording is provided for the measures. Response format is:

(1) not at all

(2) with great difficulty

(3) with some difficulty

(4) with little difficulty

(5) very easily

Based on the Stanford Patient Education Research Centre found at  
[www.RalfSchwarzer.de/](http://www.RalfSchwarzer.de/)

9/2/98

## Appendix L: Diabetes attitude questionnaire

### Diabetes Attitude Survey

Below are some statements about diabetes. Each numbered statement finishes the sentence “In general, I believe that ...”. You may believe that a statement is true for one person but not for another person or may be true one time but not be true another time. Mark the answer that you believe is true most of the time or is true for most people. Place a check mark in the box below the word or phrase that is closest to your opinion about each statement. It is important that you answer every statement. Note: The term “health care professionals” in this survey refers to doctors, nurses and dietitians.

Strongly

Strongly

Agree ☐

Agree ☐

Neutral ☐

Disagree ☐

Disagree ☐

In general, I believe that:

1. ... health care professionals who treat people with diabetes should be trained to communicate well with their patients.  
☐ ☐ ☐ ☐ ☐
2. ... people who do not need to take insulin to treat their diabetes have a pretty mild disease.  
☐ ☐ ☐ ☐ ☐
3. ... there is not much use in trying to have good blood sugar control because the complications of diabetes will happen anyway.  
☐ ☐ ☐ ☐ ☐

4. ... diabetes affects almost every part of a diabetic person's life.
- ☐ ☐ ☐ ☐ ☐
5. ... the important decisions regarding daily diabetes care should be made by the person with diabetes.
- ☐ ☐ ☐ ☐ ☐
6. ... health care professionals should be taught how daily diabetes care affects patients' lives.
- ☐ ☐ ☐ ☐ ☐

Strongly

Strongly

Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Disagree ☐

In general, I believe that:

7. ... older people with Type 2\* diabetes do not usually get complications.
- ☐ ☐ ☐ ☐ ☐
8. ... keeping the blood sugar close to normal can help to prevent the complications of diabetes.
- ☐ ☐ ☐ ☐ ☐
9. ... health care professionals should help patients make informed choices about their care plans.
- ☐ ☐ ☐ ☐ ☐
10. ... it is important for the nurses and dietitians who teach people with diabetes to learn counselling skills.
- ☐ ☐ ☐ ☐ ☐

11. ... people whose diabetes is treated by just a diet do not have to worry about getting many long-term complications.

☐ ☐ ☐ ☐ ☐

12. ... almost everyone with diabetes should do whatever it takes to keep their blood sugar close to normal.

☐ ☐ ☐ ☐ ☐

13. ... the emotional effects of diabetes are pretty small.

☐ ☐ ☐ ☐ ☐

\* Type 2 diabetes usually begins after age 40. Many patients are overweight and weight loss is often an important part of the treatment. Insulin and/or diabetes pills are sometimes used in the treatment. Type 2 diabetes is also called noninsulin-dependent diabetes mellitus or NIDDM; formerly it was called “adult diabetes”.

DAS 2/5

Strongly

Strongly

Agree ☐

Agree ☐

Neutral ☐

Disagree ☐

Disagree ☐

In general, I believe that:

14. ... people with diabetes should have the final say in setting their blood glucose goals.

☐ ☐ ☐ ☐ ☐

15. ... blood sugar testing is not needed for people with Type 2\* diabetes.

☐ ☐ ☐ ☐ ☐

16. ... low blood sugar reactions make tight control too risky for most people.

☐ ☐ ☐ ☐ ☐

17. ... health care professionals should learn how to set goals with patients, not just tell them what to do.

☐ ☐ ☐ ☐ ☐

18. ... diabetes is hard because you never get a break from it.

☐ ☐ ☐ ☐ ☐

19. ... the person with diabetes is the most important member of the diabetes care team.

☐ ☐ ☐ ☐ ☐

20. ... to do a good job, diabetes educators should learn a lot about being teachers

☐ ☐ ☐ ☐ ☐

21. Type 2\* diabetes is a very serious disease.

☐ ☐ ☐ ☐ ☐

22. ... having diabetes changes a person's outlook on life.

☐ ☐ ☐ ☐ ☐

\* Type 2 diabetes usually begins after age 40. Many patients are overweight and weight loss is often an important part of the treatment. Insulin and/or diabetes pills are sometimes used in the treatment. Type 2 diabetes is also called noninsulin-dependent diabetes mellitus or NIDDM; formerly it was called "adult diabetes."

DAS 3/5

Strongly

Strongly

Agree

Agree

Neutral

Disagree

Disagree

In general, I believe that:

23. ... people who have Type 2\* diabetes will probably not get much payoff from tight control of their blood sugars.

☐ ☐ ☐ ☐ ☐

24. ... people with diabetes should learn a lot about the disease so that they can be in charge of their own diabetes care.

☐ ☐ ☐ ☐ ☐

25. ... Type 2\* is as serious as Type 1† diabetes.

☐ ☐ ☐ ☐ ☐

26. ... tight control is too much work.

☐ ☐ ☐ ☐ ☐

27. ... what the patient does has more effect on the outcome of diabetes care than anything a health professional does.

☐ ☐ ☐ ☐ ☐

28. ... tight control of blood sugar makes sense only for people with Type 1† diabetes.

☐ ☐ ☐ ☐ ☐

\* Type 2 diabetes usually begins after age 40. Many patients are overweight and weight loss is often an important part of the treatment. Insulin and/or diabetes pills are sometimes used in the treatment. Type 2 diabetes is also called noninsulin-dependent diabetes mellitus or NIDDM; formerly it was called “adult diabetes.”

† Type 1 diabetes usually begins before age 40 and always requires insulin as part of the treatment. Patients are usually not overweight. Type 1 diabetes is also called insulin-dependent diabetes mellitus or IDDM; formerly it was called “juvenile diabetes.”

Strongly

Strongly

Agree ☐

Agree ☐

Neutral ☐

Disagree ☐

Disagree ☐

In general, I believe that:

29. ... it is frustrating for people with diabetes to take care of their disease.

☐ ☐ ☐ ☐ ☐

30. ... people with diabetes have a right to decide how hard they will work to control their blood sugar.

☐ ☐ ☐ ☐ ☐

31. ... people who take diabetes pills should be as concerned about their blood sugar as people who take insulin.

☐ ☐ ☐ ☐ ☐

32. ... people with diabetes have the right not to take good care of their diabetes.

☐ ☐ ☐ ☐ ☐

33. ... support from family and friends is important in dealing with diabetes.

☐ ☐ ☐ ☐ ☐

Revised 12/18/98 DAS 5/5

## Appendix L: Diabetes attitude scale scoring

Scale Name	Scale Equation	Special Instructions
Need for Special Training	$\sum (Q1, Q6, Q10, Q17, Q20) / \text{Number of non-missing items}$	
Seriousness of NIDDM	$\sum (Q2, Q7, Q11, Q15, Q21, Q25, Q31) / \text{Number of non-missing items}$	Reverse scores for Q2, Q7, Q11, and Q15.
Value of Tight Control	$\sum (Q3, Q8, Q12, Q16, Q23, Q26, Q28) / \text{Number of non-missing items}$	Reverse scores for Q3, Q16, Q23, Q26, and Q28.
Psychosocial Impact of DM	$\sum (Q4, Q13, Q18, Q22, Q29, Q33) / \text{Number of non-missing items}$	Reverse scores for Q13.
Patient Autonomy	$\sum (Q5, Q9, Q14, Q19, Q24, Q27, Q30, Q32) / \text{Number of non-missing items}$	

*Strongly Agree = 5; Agree=4; Neutral = 3; Disagree=2 and Strongly Disagree=1; If 50% of the items of a scale are missing, the scale should be considered as missing*

## Appendix M: Diabetes empowerment scale-short form (DES-SF)

The eight items below constitute the DES-SF. The scale is scored by averaging the scores of all completed items (Strongly Disagree =1, Strongly Agree = 5). Check the box that gives the best answer for you.

In general, I believe that I:

1. ... know what part(s) of	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
taking care of my diabetes	Strongly	Somewhat	Neutral	Somewhat	Strongly
that I am dissatisfied with.	Disagree	Disagree		Agree	Agree

2. ... am able to turn my	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
diabetes goals into a	Strongly	Somewhat	Neutral	Somewhat	Strongly
workable plan.	Disagree	Disagree		Agree	Agree

3. ... can try out different	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
ways of overcoming	Strongly	Somewhat	Neutral	Somewhat	Strongly
barriers to my diabetes	Disagree	Disagree		Agree	Agree
goals.					

4. ... can find ways to	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
feel better about having	Strongly	Somewhat	Neutral	Somewhat	Strongly
diabetes.	Disagree	Disagree		Agree	Agree

5. ... know the positive	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
--------------------------	----------------------------	----------------------------	----------------------------	----------------------------	----------------------------

ways I cope with diabetes-related stress.	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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6. ... can ask for support for having and caring for my diabetes when I need it.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree

7. ... know what helps me stay motivated to care for my diabetes.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree

8. ... know enough about myself as a person to make diabetes care choices that are right for me.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree

## **Appendix N: Measurements**

### **Body measurement: general instructions**

The measurement of body composition and function is important in the consideration of nutritional status, physical fitness and physiology.

- Introduce yourself to the participant.
- Handle the measurement procedure in a matter of fact way – just another part of recording important personal information.
- If a person does refuse to have any measurement done just note this and move on to the next measurement without placing any pressure on the person.

**At least two readings** are made for each of height, body weight, waist circumference, and blood pressure. If the two readings are beyond a specified tolerance level a third reading is recorded.

Height: more than 0.5 cm

Body weight more than 0.5 kg

Waist circumference more than 1 cm and,

Blood pressure more than 10 mm Hg

When making any measurements do not round up or down the number e.g. the decimal place for height and girths– record as accurately as possible. At least three points should

be considered for a close reading. If the reading is close to 0.5 consider whether it is closer to 0.3, 0.5 or 0.7. It is easy to round without realising!

Ask the participant to remove their shoes, and any heavy outer clothing that they may be wearing such as a coat or parka. Heavy leather belts may make a difference to weights.

**Have a container ready** to put any things such as wallet, coins into that will stay close to the participant.

### **One-on-one session checklist:**

Introduce yourself

- ✓ Have shoes and any heavy outer clothing been removed?
- ✓ Empty pockets? Put wallets, coins, keys, etc. in the container so that they can be kept close by
- ✓ If the participant does not want a measurement done make a note of this and move on to the next
- ✓ Always start with the height measurement
- ✓ Remember to measure to the smallest mark on the tape, i.e. the millimetre



Make two readings of each measurement. If the difference between the two readings is -



- Height more than 0.5 cm
- Body weight more than 0.5 kg
- Waist circumference more than 1 cm
- Blood pressure more than 10 mm Hg

... you need to take a third reading

### **Height**

Always start with a height measurement, if possible, as it is seen as the least “invasive” of all the measurements.

First, adjust the height of the scale by pulling up the top portion of the scale to a little higher than the individual’s height. Now pull out the head bar so that it is fully horizontal.

The participant is to stand on the floor with both heels firmly together and weight distributed evenly between the feet.

The back of the heels, buttocks, shoulders and back of the head should all be in a line with the back as straight as possible.

The head should be held straight with the participant looking directly forward. The measuring stick is placed in an upright position behind the participant, with the spirit level facing you, the measurer. Shift the stick slightly until the bubble in the spirit level moves into the circle. When the bubble is centred, hold the stick as still as possible to maintain the bubble's position.

Now adjust the head bar. Do this by carefully moving the bar down on to the top of the respondent's head, with sufficient pressure to compress the hair. Take care when lowering the head bar – use the left hand on the stick as a brake.

Place the thumb on the vertical piece of the head bar, so that the long end of the bar does not move down – the head bar must be fully horizontal when taking the reading.

Adjust the bubble if need be and, once centred, ask the participant to 'stand up as tall as you can' and to breathe in. Check the head position (chin must not be tilted up) and record the reading. Unit of measurement is centimetre (cm). This value is recorded to the nearest 0.1 centimetre.

### *Height Instruction*

✓ The participant should -

- Remove shoes first
- Stand on the height measure base-both heels firmly together and weight distributed evenly. Hands at side

- Keep as straight as possible - Are the back of the heels, buttocks, shoulders and back of the head in line?
- Hold head straight and look directly forward
- Check the chin is not tilted up
- Ask them to ‘stand up as tall as you can and to breathe in’
- ✓ Lower the head bar. Make sure the head bar is fully horizontal
- ✓ Shift the stick until bubble is centred and hold still
- ✓ Adjust the head bar – moving it down with sufficient pressure to compress the hair at the highest point on the head
- ✓ Take care when lowering the head bar–use the left hand on the stick as a brake
- ✓ Make sure your eye is at the same level as the reading on the tape.
- ✓ Record the value to the nearest 0.1 cm

## Weight

The scales must be placed on a hard, flat surface.

If the participant is physically unable to be weighed, e.g. in a wheelchair write this on the questionnaire.

Scales should be switched on –



Wedderburn 0-200 kg by pressing the ON button on the pole mounted panel

Wedderburn 0-150 kg by pushing the button on the front edge of the scales with your foot

When the display screen reads **0.0** the participant is to step onto the scales with both feet.

Hands are to be hanging loosely at their side and their head facing forward. The participant stands still in the centre of the platform, with the body weight evenly distributed between both feet. Stand directly over the scale to read the weight. The weight is read off the screen and recorded. The unit of measurement is kilograms (kg).

The participant is to step off the machine. Repeat the measurement, which should be within 0.1 kg.

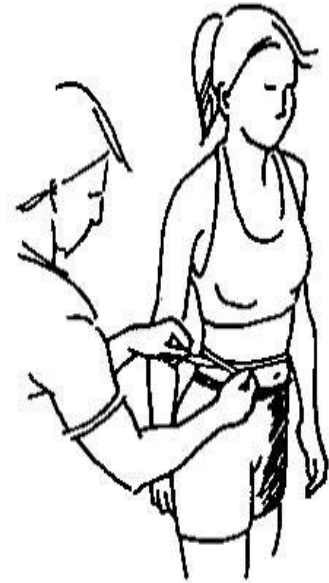
#### *Weight Instructions*

- ✓ If the participant is unable to be weighed write the reason on the questionnaire
- ✓ Ask the participant to remove shoes and as much outer clothing as possible
- ✓ Participant should be standing on both feet, hands hanging loosely by side and head facing forward
- ✓ Stand directly over the scale to read the weight
- ✓ Ask the participant to step off the scale and repeat the measurement- this should be within 0.1 kg

## Waist (girth) measures

Girth (waistline) is measured using an anthropometric tape.

The participant stands erect in a relaxed manner, arms hang loosely at the sides. It is useful to mark on the skin at the waist with ballpoint landmark points for the required measurements.



The participant stands upright in a relaxed manner, weight evenly placed on both feet and feet together.

Ask the participant to hold onto one end of the tape and walk around them with the tape. Pull the tape together gently, ensure that it is parallel to the floor-standing at the side of the participant will help you see that the tape is parallel all round.

The measurer holds the tape between the thumbs and index fingers with the second fingers stabilising and ensuring the tape is level. A cross handed technique is used to bring the zero line of the tape in line with the measuring aspect of the tape. This ensures the tape is properly located in the horizontal plane. Apply tension to the tape sufficient to maintain its position but not to cause indentation of the skin surface. The measurement to the nearest 0.1 cm is recorded.

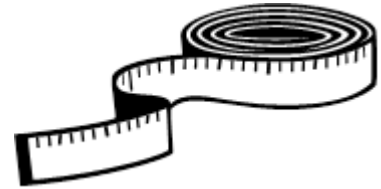
The measurement tape is very long – this length of tape will very rarely be needed and may cause you or others to trip! Half the tape may be rolled and secured with a rubber band or twist tape. It can then be easily unrolled if needed.

Ask the participant to help identify their waist, i.e. halfway between the top of the hip bone and the lower rib. Place a small mark at this point – it may be measured.

*Girth (waistline) Instructions*

- ✓ Stand at the side of the participant- so you can see that the tape is parallel all round

- ✓ For waist – ask participant to identify halfway between top of hipbone and the lower rib



Make sure the tape is parallel to the ground

- ✓ For hips – place the tape:

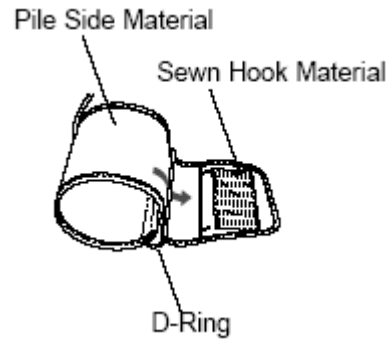
Front - at the level of the top of the pubic bone.

Back - where the bottom sticks out most (the biggest diameter)

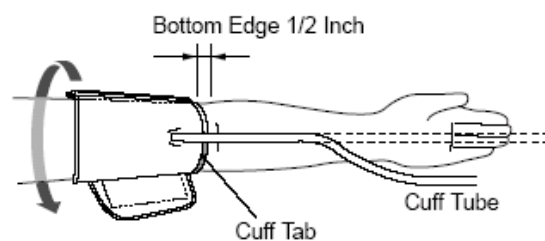
- ✓ Record the measurement to the nearest 0.1 cm

## Blood Pressure

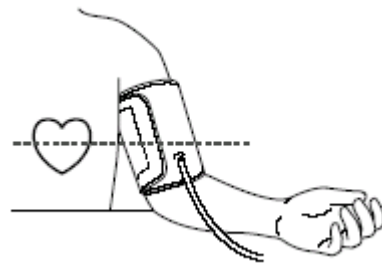
- Remove any tight fitting clothing from the left arm.
- Place the correct-sized cuff on their left arm securely. Large Cuff/Bladder Set (32-42 cm)  
Medium Cuff/Bladder Set (22-32 cm)



- Position the cuff in the proper position by placing the green line on the body side (inside) of the elbow.



- The bottom edge of the cuff should be 1 cm above the elbow.
- Make sure the entire cuff is evenly tight and that the skin will not be pinched by the D ring when the cuff is inflated. The metal slide should not be touching the skin. You should be able to fit one finger between the cuff and the arm.



- Keep the arm at heart level while measuring, preferably by resting the arm on their knee in a comfortable position. The palm should be upwards.
- Make sure that the arm is supported.
- Check that there are no kinks in the tubing.
- Press the ON/OFF button.

- After the Heart Symbol (♥) appears next to a zero on the digital panel, press the START button.
- Remain still throughout the entire reading.
- If there is any problems press the ON/OFF button and the cuff will deflate.
- When measurement is complete, the monitor displays systolic, diastolic and pulse on the digital panel and automatically deflates the cuff.
- Wait 2-3 minutes before taking another blood pressure measurement. You may require more rest time between readings

Repeat the reading and record at least two readings.

IF THE SYSTOLIC PRESSURE IS MORE THAN 200 mm Hg

OR THE DIASTOLIC MORE THAN 130 mm Hg

OR THE HEART RATE AT REST IS MORE THAN 110 beats per minute

Then, the participant must be advised to see their GENERAL PRACTITIONER PRIOR TO A SIX MINUTE FITNESS TEST OR EXERCISE OR PHYSICAL ACTIVITY

## **Changing the batteries**

Slide the battery cover off in the direction of the arrow.

Install or replace four "AA" size batteries so + (positive) and – (negative) polarities match the polarities of the battery compartment as indicated.

Replace the battery cover.

If the Low Battery Indicator (⌀) appears on the display, replace all four batteries. Long-life alkaline batteries are recommended.

Remove the batteries if the monitor will not be used for an extended period of time.

## **How to Use the Memory Function**

Fourteen measurement values will be stored.

Push the M Button while a (♥) mark is displayed.

- Maximum of fourteen stored measurement values can be called out.
- For the fifteenth measurements and after, the values from the oldest measurement will be deleted.

## **Error Indicator**

Error messages (E) will be shown when

- Cuff under-inflated, i.e. the blood pressure is higher than the pressure the cuff was inflated to – wait a minute or so and repeat the measurement

- Movement during measurement.
- Cuff over-inflated (more than 300 mm Hg).
- Battery voltage is excessively low.

To protect the monitor from damage, please

- **DO NOT** put the monitor in extreme temperatures, humidity and direct sunlight.
- **DO NOT** fold the cuff and tubing tightly.
- **DO NOT** inflate the monitor over 280 mm Hg.
- **DO NOT** disassemble the monitor.
- **DO NOT** expose the monitor to strong shocks (e.g. dropping the monitor on the floor.)
- **DO NOT** clean the monitor with liquids.

THE MONITOR SHOULD BE CLEANED WITH A SOFT, DRY CLOTH.

### *Blood Pressure Instructions*

- ✓ Place the cuff with the green line on the inside of the elbow – with the bottom of the cuff 1 cm above the elbow
- ✓ Make sure the cuff is evenly tight – can you fit one finger between the cuff and the arm?
- ✓ Is the arm at heart level and supported?
- ✓ Remind the participant to remain very still
- ✓ Operating Instructions
  - After ♥ appears next to a zero on the panel press the START button
  - If there are any problems press the ON/OFF button and the cuff will deflate
  - Error messages (E) –
    1. Cuff under inflated
    2. Cuff over inflated
    3. Movement during measurement
    4. Batteries low

Wait 2-3 minutes before doing another blood pressure reading

## **Biological measurements**

Table A.1 Changes of biological measurements measured by the researcher for each mode of delivery (waea/telephone or kanohi-ki-te-kanohi/face-to-face) at the at the three different time points (baseline, six months and 12 months).

Table A.2 Changes of biological measurements measured by Pathlab and general practitioner for each mode of delivery (waea/telephone or kanohi-ki-te-kanohi/face-to-face) at the three different time points (baseline, six months and 12 months).

Table A.10.1

*Changes of biological measurements measured by the researcher for each mode of delivery (waea/telephone or kanohi-ki-te-kanohi/face-to-face) at the at the three different time points (baseline, six months and 12 months).*

Characteristic	Waea/Telephone (n = 72)			Kanohi-ki-te-kanohi/face-to-face (n = 80)		
	Baseline	6 months	12 months	Baseline	6 months	12 months
	[n]	[n]	[n]	[n]	[n]	[n]
	Mean (SD) (95%CI)	Mean (SD) (95%CI)	Mean (SD) (95%CI)	Mean (SD) (95%CI)	Mean (SD) (95%CI)	Mean (SD) (95%CI)
Body weight (kg)	[72] 104.9 (27.8) (98.4, 111.5)	[40] 103.9 (25.5) (95.8, 112.1)	[31] 103.1 (27.4) (93.1, 113.2)	[80] 108.5 (24.4) (103.1, 114.0)	[54] 108.4 (27.8) (100.8, 116.0)	[37] 109.1 (27.5) (99.9, 118.2)
Waist circumference (cm)	[71] 121.8 (18.7) (117.4, 126.2)	[40] 120.8 (21.5) (113.9, 127.6)	[31] 118.2 (19.9) (110.9, 125.5)	[80] 125.3 (19.1) (121.0, 130.0)	[54] 120.5 (18.6) (115.4, 125.5)	[37] 119.9 (17.2) (114.2, 124.7)
Systolic BP (mmHg)	[71] 135.4 (17.6) (131.3, 139.6)	[39] 13.8 (15.5) (128.8, 138.8)	[30] 133.2 (16.9) (126.9, 139.5)	[79] 143.7 (19.2) (139.4, 148.1)	[52] 143.5 (21.4) (137.5, 149.4)	[34] 140.5 (22.0) (132.8, 148.1)
Diastolic BP (mmHg)	[70] 81.6 (10.7) (79.0, 84.2)	[39] 78.5 (11.5) (74.8, 82.3)	[30] 77.1 (13.3) (72.1, 82.0)	[79] 85.6 (13.4) (82.6, 88.6)	[52] 82.8 (13.3) (79.1, 86.5)	[34] 82.6 (11.1) (78.7, 86.5)

*Notes.* 95% confidence intervals expressed as lower bound, upper bound; BP = blood pressure

Table A.10.2

*Changes of biological measurements measured by Pathlab and general practitioner for each mode of delivery (waea/telephone or kanohi-ki-te-kanohi/face-to-face) at the three different time points (baseline, six months and 12 months)*

Characteristic	Waea/Telephone (Potential n = 72)			Kanohi-ki-te-Kanohi/Face-to-face (Potential n = 80)		
	Baseline	6 months	12 months	Baseline	6 months	12 months
	[n]	[n]	[n]	[n]	[n]	[n]
	Mean (SD) (95%CI)	Mean (SD) (95%CI)	Mean (SD) (95%CI)	Mean (SD) (95%CI)	Mean (SD) (95%CI)	Mean (SD) (95%CI)
HbA1c (%)	[51] 8.2 (2.1) (7.7, 8.8)	[49] 8.0 (1.8) (7.5, 8.6)	[48] 8.1 (1.9) (7.5, 8.6)	[51] 8.0 (2.0) (7.4, 8.5)	[47] 7.8 (1.7) (7.3, 8.3)	[44] 7.5 (1.5) (7.0, 7.9)
HDL (mmol/l)	[49] 1.02 (0.41) (0.90, 1.14)	[48] 1.01 (0.23) (0.94, 1.08)	[47] 1.00 (0.27) (0.92, 1.08)	[51] 0.94 (0.28) (0.87, 1.02)	[48] 1.00 (0.31) (0.91, 1.09)	[47] 0.99 (0.27) (0.92, 1.07)
TC (mmol/l)	[47] 5.3 (1.5) (4.9, 5.7)	[47] 4.8 (1.1) (4.4, 5.1)	[46] 4.8 (1.5) (4.4, 5.3)	[51] 5.4 (1.7) (4.9, 5.9)	[48] 5.0 (1.5) (4.5, 5.4)	[47] 5.1 (2.1) (4.4, 5.7)
Triglyceride (mmol/l)	[49] 2.4 (2.1) (1.8, 3.0)	[49] 2.1 (1.6) (1.7, 2.5)	[47] 2.2 (2.0) (1.6, 2.7)	[51] 2.2 (1.5) (1.8, 2.6)	[48] 2.0 (1.4) (1.6, 2.4)	[47] 2.1 (1.6) (1.6, 2.5)

*Note.* 95% confidence intervals expressed as lower bound, upper bound

## **Appendix O: Ethics forms**

Form contents approved from Northern Y Regional committee and Auckland University of Technology Ethics Committee

1. Cover letter
2. Panui/Information Sheet
3. Consent form
4. Promotional release form
5. GP letter for clinical results

**Cover letter**

Research Title:

What makes people living with diabetes increase their uptake of physical activity?

Kia Ora/Hi!

My name is Margaret Williams, I am a doctoral student within the Sport and Recreation Department of the Health & Environmental Sciences Faculty based at Auckland University of Technology. This research/study is funded by Sport and Recreation New Zealand/Aotearoa and is hosted by Sport Waikato.

If you are over the age of 18 years, living with pre-existing diabetes or new diabetes, live within the Waikato and Lakes District Health Board areas and you are not receiving insulin therapy then I am inviting you to take part in a three year study investigating ways to support physical activity among people with diabetes.

In this study you will receive personalised physical activity support for at least 3months from qualified staff. There is no fee or cost to take part in this study and your participation is purely voluntary.

I have attached an information sheet describing the research in more detail. You may also contact me or Amiria McGarvey (Green Prescription Coordinator) at Sport Waikato for further details.

Thank you for your time and effort.

Margaret H. Williams

## **Panui/Information Sheet**

Research Title:

What makes people living with diabetes increase their uptake of physical activity?

I would like to invite people over the age of 18 years who are living with pre-existing or newly diagnosed diabetes, who are not receiving insulin therapy to participate in this study.

If you decide to take part in this 12 month study, then for **no cost/fee** a trained physical activity support person will help to develop a physical activity programme for you and work with you either by telephone or face-to-face contact.

The study also involves an initial meeting to collect baseline data followed by two meetings at 6-monthly intervals (i.e. 6<sup>th</sup> month and 12<sup>th</sup> month) to measure your progress. These meetings may range from 30-50 minutes. The study therefore involves:

- Meeting the researcher who will provide a detailed explanation of the study.  
You may also meet or talk to the physical activity support people
- Registration and signing your consent to participate
- Completing questionnaires about your health, how much physical activity you and your family do and things that may or may not motivate you to do physical activity
- Body weight, height, waist circumference, and blood pressure measurements will be taken.

You will be guaranteed anonymity and confidentiality. It is also important for me to remind you that your participation is purely voluntary, and that should you decide not to participate in this study this will not impact on your overall health care services.

In the unlikely event of a physical injury as a result of your participation in this study, you may be covered by ACC under the Injury Prevention, Rehabilitation and Compensation Act. ACC is not automatic and your case will need to be assessed by ACC according to the provisions of the 2002 Injury Prevention Rehabilitation and Compensation Act. If your claim is accepted by ACC, you still might not get any compensation. This depends on a number of factors such as whether you are an earner or non-earner. ACC usually provides only partial reimbursement of costs and expenses and there may be no lump sum compensation payable. There is no cover for mental injury unless it is a result of physical injury. If you have ACC cover, generally this will affect your right to sue the investigators.

If you have any questions about ACC, contact your nearest ACC office or the investigator.

Finally, I would like to thank you for considering participating in this research. I hope that this small piece of work will contribute to you and/or your whānau/family's overall well-being.

Yours faithfully

Margaret H. Williams

## **Consent Form**

Research Title: What makes people living with diabetes increase the uptake of physical activity?

I have read and I understand the information in the sheet dated 01/11/06 for those taking part in a three year study designed to look at ways of increasing the uptake of physical activity.

I have had an opportunity to ask any questions and to discuss my participation with the researcher. My questions have been answered to my satisfaction.

I understand that taking part in this research is voluntary (my choice) and that I may withdraw at any time without any reasons having to be given and this will in no way affect my future health care

I understand that my participation in this study is confidential and that my identity will not be disclosed in any way, shape or form in any reports resulting from the study

I know whom to contact if I have any questions about the study

I agree for my health information to be accessed by the study team for the purposes of assessing the impact of finding ways to increase the uptake of physical activity

I agree for the in-depth interviews to be audio taped with the understanding that summaries from the interviews will be made available to me should I request such

I agree to be contacted for future research/studies of this nature (Please tick the appropriate box). Yes ☐ No ☐

In the unlikely event of a physical injury as a result of your participation in this study, you may be covered by ACC under the Injury Prevention, Rehabilitation and Compensation Act. ACC is not automatic and your case will need to be assessed by ACC according to the provisions of the 2002 Injury Prevention Rehabilitation and Compensation Act. If your claim is accepted by ACC, you still might not get any compensation. This depends on a number of factors such as whether you are an earner or non-earner. ACC usually provides only partial reimbursement of costs and expenses and there may be no lump sum compensation payable. There is no cover for mental injury unless it is a result of physical injury. If you have ACC cover, generally this will affect your right to sue the investigators.

If you have any questions about ACC, contact your nearest ACC office or the investigator.

I \_\_\_\_\_ (full name) hereby  
consent to take part in this study

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

I would also like to receive a copy of the final report of this research. Please send to the following electronic email address: \_\_\_\_\_ and/or the following

Postal address: \_\_\_\_\_

This study was approved by the Northern Y Regional Ethics Committee (Ref. No: NTY/07/12/137). If you have any questions please contact the Principal Investigator, Margaret H. Williams on 64 573 7966 or the health advocacy Service for Mid and Lower North Island on 0800 42 36 38 (0800ADNET)

## Appendix P: Promotional release form



### Promotional Release Form

Sport Waikato is a not-for-profit charitable trust which believes in “everyone inspired to be active and healthy for life.”

This release form confirms that I give my consent for a representative from “Sport Waikato” to interview and/or photograph and/or video me. I give my consent for Sport Waikato to use my comments and/or image in its promotional material. I agree that Sport Waikato shall own the rights to the said image(s) and/or word(s), but will not use my image(s) and/or word(s) for commercial gain.

Sport Waikato may use the image(s)/word(s) for promotion of its initiatives, encouraging people to be active, healthy, and participate in sport. Promotion may include:

- ☐ Advertising
- ☐ Publications
- ☐ Media releases
- ☐ Newsletters
- ☐ Any other Sport Waikato promotional material

I agree this authority will remain in force until such time as I cancel by giving my notice in writing and that all previously produced materials will continue to be in circulation.

Full name .....

Address .....

Phone .....

Signature ..... Date .....

For Sport Waikato

Full name .....

Signature ..... Date .....

NB: Two copies of this form must be completed and signed, with each party to retain one.

## **Appendix Q: GP letter and evaluation forms**

Increasing the uptake of physical activity using a kanohi-ki-te-kanohi/face-to-face approach or the current telephone approach for the Green Prescription programme

Ethics Approval number NTY/07/12/137

Reference: Participant number GRx/\*\*\*\*\*

[Medical Centre Address]

[Current Date]

Dear

You referred ..... to Sport Waikato for a Green Prescription on the ..../../. As part of the evaluation of this new 6-month intervention, we are writing to the GPs of all participants for their help in collating laboratory and clinical information. We are also seeking GP opinions on whether the intervention changed the lifestyle of the named patient and for any comments (negative and positive) about the Green Prescription programme overall and in relation to the named patient. All participants have provided signed consent for their health information to be accessed by the study team for the evaluation.

We appreciate that you are busy but would be most grateful if you could provide us with this information. There are two main aspects:

1. Laboratory and Clinical Information
2. Your opinion on how the Green Prescription has helped (or otherwise) this patient

To make it easy, we enclose a stamped addressed envelope to send us the information.

Laboratory and Clinical Information

For this, please either:

- print off the electronic patient record and send to us (to include the Get Checked data, hospitalisation data and medication data)
- complete the attached form and send to us

Opinion on Green Prescription

For this, please complete the attached one page form and send or fax to us on XXX

Many thanks for this assistance. We look forward to sending you a report on completion of this study.

Please do not hesitate to contact Margaret H. Williams, the principal research investigator, on 027 658 4801 for all queries.

David Simmons FRACP MD

Diabetes Specialist for the study team

Reference GRx/#

Please note date with each measurement value

Measurement	Initial	6 months	12 months	Comments
Normal value	30.01.09	14.08.09	24.02.10	
HbA1C				
Less than 6%				
Blood pressure				
Less than 140				
systolic, and 90				
diastolic				
Fasting glucose				
Less than 6.1				
mmol/litre				
Total Cholesterol				
Less than 5.0				
mmol/litre				
HDL				
More than 1				
mmol/litre				
LDL				
Less than 3.4				
mmol/litre				
Triglycerides				
Less than 1.9				
mmol/litre				
Glucose control	poor/med/good	poor/med/good	poor/med/good	
Medications				
Please insert type and				
dose				
Albumin/Creatinine				
Ratio				
Weight				
kg				

Reference GRx/#

Your opinion on how the Green Prescription has helped (or otherwise) this patient

Did the Green prescription increase the physical activity of this patient? If yes, how?

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Was the Green Prescription helpful in any other ways? If yes, how?

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Do you have any other comments about the 6 month Green prescription programme for this patient?

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Overall, the Green Prescription helped this patient (please circle one):

Absolutely	A little	Probably	Doubtful	No	Not at all	Do not know
						

Did the Green Prescription harm this patient (please circle one)?    Yes                      No

How:

---

## **Appendix R: Green prescription (6-month) delivery modes resources and processes**

### **Waea/telephone process**

#### *First waea/telephone call (Ph)*

- Introduction / whakawhānaungatanga
- Participant analysis
- Physical Activity Session
- 4-week exercise programme
- Starter Pack via Mail
- Book second phone

#### *Second and third waea/telephone calls*

- 4-week exercise programme
- Physical Activity Session
- Book subsequent phone call
- RESOURCES if necessary

#### *Fourth waea/telephone call*

- 4-week exercise programme
- Participant Analysis
- Physical Activity Session
- Book fifth phone
- RESOURCES if necessary

*Fifth waea/telephone call*

- 4-week exercise programme
- Supermarket Tour
- Book six phone
- RESOURCES if necessary

*Sixth waea/telephone call*

- 4-week exercise programme
- Supermarket Tour
- Book seventh phone
- RESOURCES if necessary

*Seventh waea/telephone call*

- Re-visit goals, barriers, successes failures etc.
- Renew or close – refer to researcher
- Kanohi-ki-te-kanohi/face-to-face process

**First kanohi-ki-te-kanohi/face-to-face visit (f<sub>2</sub>f)**

- Introduction / whakawhānaungatanga
- Participant analysis
- Physical Activity Session
- 4-week exercise programme
- Starter Pack
- Book second visit

#### *Second and third visit*

- 4-week exercise programme
- Physical Activity Session
- Book third, then fourth visit
- RESOURCES if necessary

#### *Fourth visit*

- 4-week exercise programme
- Participant Analysis
- Physical Activity Session
- Book fifth visit
- RESOURCES if necessary

#### *Fifth visit*

- 4-week exercise programme
- Supermarket Tour
- Book seventh visit
- RESOURCES if necessary

#### *Sixth visit/final Visit*

- Re-visit goals, barriers, successes, failures, etc.
- Renew or close