

# Face-to-face versus telephone delivery of the Green Prescription for Māori and New Zealand Europeans with type-2 diabetes mellitus: influence on participation and health outcomes

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## ABSTRACT

**AIM:** In Aotearoa/New Zealand, the proportion of Māori who participate in the national Green Prescription lifestyle programme is lower than for New Zealand Europeans. We compared the uptake and effectiveness of two modes of Green Prescription delivery: face-to-face and telephone among both Māori and New Zealand Europeans.

**METHOD:** Sixty-eight Māori and 70 New Zealand Europeans with type-2 diabetes participated in this six-month randomised trial of the two modes of delivery. Recruitment integrated an explicitly Māori culturally sensitive approach. All participants received lifestyle intervention. Anthropometry, blood lipids and glycated haemoglobin were measured before and after the intervention.

**RESULTS:** The face-to-face approach (first meeting) yielded 100% uptake into the programme among both Māori and New Zealand Europeans. At six months there were overall reductions in weight (1.8; [95 CI%, 0.6, 2.9kg]), waist circumference (3.7 [2.6, 4.8cm]), and total cholesterol (0.6 [0.3, 0.9mmol/l]) and glycated haemoglobin (3.1 [-0.2, 6.7mmol/mol]). There were no significant differences by mode of delivery, ethnicity or gender.

**CONCLUSION:** The Green Prescription programme resulted in small but clinically favourable improvements in health outcomes for type-2 diabetes patients, regardless of the mode of delivery for both Māori and New Zealand Europeans.

Improving blood glucose, lipids, weight and blood pressure reduces complications among patients with type-2 diabetes mellitus.<sup>1,2</sup> Such improvements can be realised through increased physical activity, healthy eating and appropriate pharmacological treatment.<sup>3,4</sup> In Aotearoa/New Zealand a number of lifestyle interventions exist,<sup>5</sup> including the national Green

Prescription (GRx) health service, which is usually delivered through a regional sports trust. Individuals referred to the national GRx programme receive a three-month service, including four telephone calls, mailed support material with tailored support and advice from a GRx facilitator about the recommended quality and quantity of physical activity and food.<sup>6,7</sup>

The prevalence of type-2 diabetes among Māori, the indigenous people of Aotearoa/ New Zealand, is twice that of New Zealand Europeans, and is associated with a greater risk of diabetes complications.<sup>8</sup> Clearly, there is a need to understand better how health outcomes for Māori can be enhanced after diabetes has been diagnosed<sup>5</sup> and one approach includes improving uptake of physical activity. Māori have a low participation rate in the GRx service (ie, <16%),<sup>7,8,9</sup> and there is a need to improve their uptake into this programme. There are two steps needed for participation in an effective health service—the first is to gain trust to assist the entry of the individual into the service, and the second is to have good adherence during the service itself. It has been suggested that Māori prefer face-to-face delivery over telephone delivery, especially for strengthening mutual trust and understanding.<sup>10,11,12</sup>

Therefore, the aim of this study was to compare the effect of face-to-face and telephone modes of delivery of the national GRx programme on participation and health outcomes (including glycaemic control, blood lipid profile, anthropometric and cardiovascular risk factors) on Māori and Europeans newly diagnosed with type-2 diabetes.

## Methods

This was an open-label randomised trial (ACTRN1261000165088) undertaken through Sport Waikato, a regional sports trust that serves the Waikato province of Aotearoa/ New Zealand. Waikato spans 21,220 km<sup>2</sup> and includes one metropolitan city and 10 small rural/semi-rural towns. In general, the relative socioeconomic status is low, particularly for Māori.<sup>13</sup>

### Study design: kaupapa Māori research

A kaupapa Māori framework/research ethics were utilised<sup>10,11,12</sup>, in an attempt to improve engagement in the GRx health service for both Māori and New Zealand Europeans. This approach included the integration of Māori culture, principles and values, knowledge and language into the communication,<sup>11,14</sup> underpinned by the Treaty of Waitangi principles of participation, partnership and protection.<sup>15</sup>

Traditionally, such approaches require face-to-face engagement promoting whakamana (empowerment).<sup>11–13</sup> For Māori these are achieved through whānaungātanga (strengthening mutual relationships), manaakitanga (enhancing the integrity of the person) and pātaka mātauranga (sharing knowledge that leads to understanding and responsibility). Therefore an understanding of the individual in their community needs to be considered as part of the communication with participants and for improving health literacy holistically.<sup>10,12</sup> A reference group of health professionals and Māori/Iwi leaders was formed to guide and implement this trial, provide opportunities, establish working relationships that would reach potential participants and develop a kaupapa Māori GRx working manual for Sport Waikato. In the planning stages, meetings with the reference group occurred monthly while fortnightly meetings occurred with the Sport Waikato team, including the Māori GRx facilitator employed for the delivery of this trial. Utilising a kaupapa Māori approach to research and health literacy focuses on respectful relationship with participants, their families and community. Ethical approval was provided by the Northern Y ethics committee, reference number, NTY/07/12/137. The study recruitment period occurred over an 18-month period from November 2008 until February 2010.

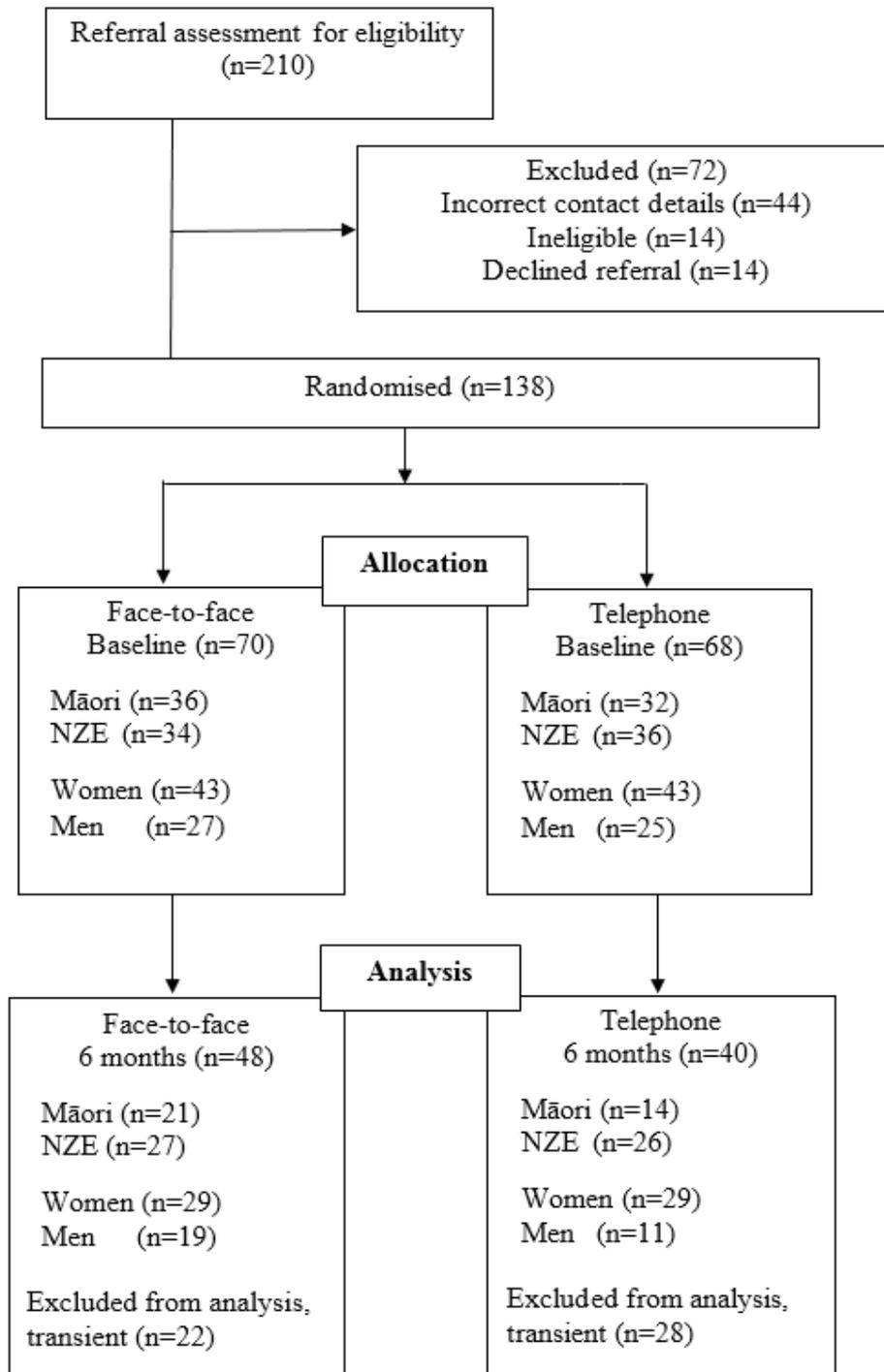
### Recruitment and participation

Initial contact occurred between a patient and primary care provider (ie, general practitioner and/or practice nurse) who assessed their suitability for referral to the GRx trial for Sport Waikato. Patients who were on insulin therapy or likely to receive insulin therapy or dialysis treatment in the next 12 months, had ambulatory problems or conditions that would prevent participation in physical activity, were excluded. Eligible participants were then invited to participate in the study by Sport Waikato (Figure 1). Subsequently, referrals were excluded prior to the trial because their contact details were invalid, incorrectly identified as eligible, which included other ethnicities, or who declined participation. The selected patients received a first face-to-face meeting with a female Māori researcher (MHW) who explained why and how the GRx programme

may benefit his or her health and management of type-2 diabetes. This was a key feature of the informed consent process. Written informed consent to participate was then obtained and baseline health outcome measures recorded.

An independent administrator subsequently used an electronically generated randomisation schema, stratified by ethnic group, to assign participants randomly to receive either face-to-face or telephone modes of delivery. Figure 1 shows the CONSORT diagram.

**Figure 1:** Recruitment, randomisation and participation at baseline and after six months of the GRx research study.



NZE = New Zealand Europeans. Transient = no forwarding contact details.

### Health outcome measures

Anthropometric measures were obtained in triplicate for: height (to nearest 0.5cm) without shoes using a portable stadiometer (PE87 portable stadiometer Mentone Educational, Moorabbin, Victoria, Australia); body weight (to nearest 0.1kg) in light clothing and without shoes (Wedderburn Electronic Scale 0–150kg, Auckland, NZ); standing waist circumference obtained at the lateral mid-point between the lower rib and the iliac crest (to nearest 0.5cm). Mean values including body mass index were calculated for each participant. Systolic and diastolic blood pressure, and heart rate were recorded after a minimum sitting rest period of 5 min using an Omron IntelliSense Automatic Blood Pressure Monitor (Kyoto, Japan). Biochemical tests were undertaken by Path Lab Waikato Limited, an NZS/ISO 15189:2007 accredited laboratory (International Accreditation New Zealand) and included HbA<sub>1c</sub> (mmol glycated Hb/mol total Hb), and blood lipids (total cholesterol, high-density lipoprotein, low-density lipoprotein, triglyceride concentrations [mmol/L]).

The New Zealand physical activity questionnaire short form (NZPAQSF) was administered with assistance as required.<sup>16,17</sup> These measures were obtained close to the baseline and trial termination time points. Some participants had incomplete assessments despite attempts to obtain these data.

### Delivery of the GRx intervention

Participants received monthly one-on-one support for six months by either the face-to-face or telephone approach. A Māori GRx facilitator trained in nutrition, physical activity and motivational interviewing delivered the GRx programme. The same information was communicated regardless of the delivery approach. In the first session, a physical exercise and healthy eating plan following Ministry of Health healthy eating guidelines<sup>18</sup> was negotiated, and support

materials were provided either by post or in person. The physical activity plans incorporated walking, swimming, weight training and also utilised common activities such as washing clothes, vacuuming or gardening. Participants set achievable goals for increasing incidental physical activity and to consume healthier foods for the next month. For the face-to-face delivery the session time with the GRx facilitator was 15–60 min in a setting agreed to by the participant. In most cases this was the home of the participant.

### Statistical analysis

Data are presented as mean, standard deviation and range for continuous variables. Categorical variables are reported as both frequency and percentages. Participation differences were assessed using the Fisher test. Differences are compared using paired *t*-test (baseline to completion) or unpaired *t*-test (between groups). Differences between the groups were also shown with the 95% CI for the difference of means. Statistical analyses were performed using IBM SPSS Statistics version 22 (IBM Corporation, Armonk, New York).

## Results

Figure 1 shows that of the 1,755 referred to the Sport Waikato GRx programme, 210 were referred into the trial, of whom 138 were eligible, contactable and agreeable to being referred into the trial. All of the 138 attendees to the first face-to-face GRx information meeting gave informed consent to participate (49% Māori, 62% women). Of these, 64% (88/138) actively participated to the cessation of the six-month trial. Drop-out at six months was greater for Māori (49%, 33/68) than for New Zealand Europeans (24%, 17/70 ( $p=0.04$ )). Attrition for the face-to-face and telephone approach were 31% (22/70) and 41% (28/68) respectively overall ( $p=0.509$ ), and 41% (15/36) and 56% (18/32) respectively among Māori ( $p=0.529$ ).

**Table 1:** Baseline health outcome characteristics of patients newly diagnosed with type-2 diabetes distinguished by ethnicity and gender.

Measure	Māori (n=68)		New Zealand Europeans (n=70)	
	Women (n=39)	Men (n=29)	Women (n=47)	Men (n=23)
Age (yr)	53±10 [35, 74]	56±12 [35, 80]	57±13 [30, 83]	62±13 [38, 86]
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]
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]
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]
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]
Systolic BP (mmHg)	142±19 [102, 179]	138±19 [106, 172]	138±20 [107, 183]	139±17 [107, 183]
Diastolic BP (mmHg)	88±12 [68, 122]	86±12 [54, 113]	80±13 [54, 112]	80±10 [61, 98]
Resting heart rate (beat/min)	74±11 [53, 94]	72±12 [51, 101]	72±13 [49, 100]	70±11 [52, 91]
HbA <sub>1c</sub> (mmol/mol)	58.4±21.2 (n=36) [38.8, 121.9]	72.3±23.9 (n=19) [41.0, 121.9]	68.9±21.8 (n=22) [38.8, 125.2]	68.2±23.9 (n=15) [46.5, 118.6]
<b>Physical activity</b>				
Briskly walking {min/wk}	13 {0, 42} <sup>a</sup> 30 {8, 33}	20 {0, 40} <sup>a</sup> 30 {16, 99}	20 {0,40} <sup>a</sup> 30 {15, 60}	10 {0, 30} <sup>a</sup> 38 {16, 330}
Moderate activity {min/wk}	75 {0, 54} <sup>a</sup> 0 {0, 285}	195 {0, 375} <sup>a</sup> 90 {0, 225}	90 {0, 180} <sup>a</sup> 105 {0, 225}	40 {0, 210} <sup>a</sup> 90 {0, 427}

Data are mean values ± standard deviation; range [minimum, maximum]; n = number of participants; BMI = body mass index; BP = blood pressure; HbA<sub>1c</sub> = glycated haemoglobin.

Median {Q<sub>1</sub>, Q<sub>3</sub>} = Q<sub>1</sub>, the 25<sup>th</sup> percentile; Q<sub>3</sub>, the 75<sup>th</sup> percentile at baseline and <sup>a</sup>Median {Q<sub>1</sub>, Q<sub>3</sub>} = Q<sub>1</sub>, the 25<sup>th</sup> percentile; Q<sub>3</sub>, the 75<sup>th</sup> percentile at six months.

**Table 2:** Influence of the GRx programme on health outcome measures distinguished by mode of delivery.

Measure	All			Face-to-face			Telephone		
	Baseline	6 months	Mean difference	Baseline	6 months	Mean difference	Baseline	6 months	Mean difference
Body weight (kg)	107.0±24.8 (n=88)	105.2±24.8 (p=0.03)	-1.8 (-0.6, -2.9)	108.2±25.3 (n=48)	106.2±24.4 (p=0.033)	-2.0 (-0.2, -3.8)	105.4±25.7 (n=40)	103.9±25.4 (p=0.031)	-1.5 (-0.1, -2.9)
Waist circumference (cm)	122.8±17.9 (n=86)	119.1±17.5 (p<0.001)	-3.7 (-2.6, -4.8)	123.1±18.9 (n=47)	119.4±17.9 (p<0.001)	-3.7 (-2.0, -5.4)	122.4±17.0 (n=39)	118.7±17.1 (p<0.001)	-3.8 (-2.4, -5.1)
HbA <sub>1c</sub> (mmol/mol)	65.7±23.6 (n=64)	62.6±19.9 (p=0.069)	-3.1 (0.2, -6.7)	65.6±24.5 (n=34)	60.8±18.9 (p=0.059)	-4.8 (0.2, -9.8)	65.7±23.0 (n=30)	64.5±21.0 (p=0.599)	-1.2 (3.4, -5.8)
TC (mmol/L)	5.3±1.7 (n=57)	4.7±1.4 (p<0.0001)	-0.6 (-0.3, -0.9)	5.4±1.8 (n=33)	4.9±1.7 (p=0.002)	-0.6 (-0.2, -0.9)	5.1±1.5 (n=24)	4.5±1.0 (p=0.022)	-0.6 (-0.1, -1.2)
HDL (mmol/L)	1.0±0.4 (n=59)	1.0±0.3 (p=0.66)	0.02 (0.11, -0.07)	0.9±0.3 (n=33)	1.0±0.4 (p=0.049)	0.1 (0.1, 0.0)	1.1±0.5 (n=26)	1.0±0.2 (p=0.578)	0 (0.1, -0.2)
TC/HDL	6.3±3.6 (n=57)	5.9±3.0 (p=0.064)	-0.4 (0.0, -0.8)	6.8 ± 4.1 (n=33)	6.2±3.5 (p=0.048)	-0.6 (0.0, -1.1)	5.5±2.7 (n=24)	5.4±2.1 (p=0.729)	-0.1 (0.4, -0.6)
LDL (mmol/L)	2.8±1.0 (n=54)	2.7±0.9 (p=0.326)	-0.1 (0.1, -0.3)	2.7±0.8 (n=31)	2.7±0.9 (p=0.93)	0 (0.2, -0.2)	2.9±1.2 (n=23)	2.7±0.8 (p=0.262)	-0.2 (0.2, -0.7)
Triglycerides (mmol/L)	2.4±2.0 (n=60)	2.1±1.7 (p=0.076)	-0.3 (0.0, -0.7)	2.3±1.6 (n=33)	2.0±1.6 (p=0.023)	-0.3 (0, -0.6)	2.5±2.5 (n=27)	2.2±1.8 (p=0.36)	-0.3 (0.4, -1.1)
Systolic BP (mmHg)	139±19 (n=82)	139±19 (p=0.967)	0 (4, -4)	143±20 (n=44)	143±22 (p=0.935)	0 (6, -6)	134±15 (n=39)	134±15 (p=0.967)	0 (5, -5)
Diastolic BP (mmHg)	83±13 (n=82)	83±14 (p=0.680)	-2 (1, -4)	85±16 (n=44)	83±14 (p=0.193)	-2 (1, -6)	80±9 (n=38)	79±12 (p=0.476)	-1 (2, -4)

Data are mean values ± standard deviation; 95% confidence interval of the difference (in brackets); n = number of participants; BP = blood pressure; HbA<sub>1c</sub> = glycated haemoglobin. TC=total cholesterol, HDL= high density lipoproteins, TC/HDL = total cholesterol/high density lipid cholesterol ratio, LDL= low density lipoproteins. Data are shown only when both baseline and 6 months values were obtained for each participant.

Baseline characteristics for all participants are shown in Table 1. After six months intervention (Table 2), there were significant reductions in weight, waist circumference and total cholesterol, but no significant differences in change of body weight or waist circumference according to mode of delivery. When data from both modes of delivery were combined, (Table 2) there was a 1.8kg reduction in body weight and 3.7cm reduction in waist circumference. The HbA<sub>1c</sub> concentration fell by 3.1mmol/mol across the 64 participants with data. This effect was dominated by a lowered HbA<sub>1c</sub> in patients who displayed a poorer glucose regulation at baseline, ie, HbA<sub>1c</sub> >80mmol/mol. This small effect was slightly, but insignificantly, greater with the face-to-face than telephone approach. The GRx trial was associated with a significant but small reduction in total plasma cholesterol concentration. Changes in plasma high-density lipoproteins and triglyceride concentrations did not differ

significantly with mode of delivery (Table 2). There was no overall influence of the GRx intervention on arterial blood pressure (Table 2). No significant differences were found across ethnicity or gender.

The NZPAQSF data revealed that overall at baseline the individual's total time spent in physical activity was extremely low (Table 1). The majority of participants (90%) did not undertake the recommended 30 min per day of brisk walking on five or more days per week. Many participants (36%) reported that they did not do any brisk walking or physical activity over the previous six months, while 20% reported no moderate or vigorous physical activity. Between baseline and the cessation of the six months GRx trial, the proportion of participants who were completely inactive (ie, no time at least brisk walking) halved (Table 1). Overall there was no statistically significant change in time spent walking following the treatment.

## Discussion

This is the first study to assess the effectiveness of the national GRx health service after six months of treatment among Māori and New Zealand Europeans newly diagnosed with type-2 diabetes. The major findings were that: the face-to-face first meeting, used as the GRx information session, yielded a 100% uptake into the study and the service; and overall the six months GRx trial was associated with clinically favourable albeit small reductions in weight, waist circumference and total cholesterol concentrations, without notable differences attributed to mode of delivery.

### Participation

A key question addressed in this study was whether the face-to-face approach was associated with greater benefit than the telephone support for both Māori and New Zealand Europeans, especially in relation to participation. This notion derived from preliminary work,<sup>19</sup> which indicated that Māori preferred such an approach. The initial face-to-face information meeting prompted every patient that attended to sign up as a participant in the GRx trial (ie, 100% uptake). This exceeded recruitment numbers in earlier studies.<sup>7,8</sup> Moreover, a concern identified in a previous national GRx health service survey was the paucity (<4%) of Māori participants.<sup>7</sup> In the present study this was improved with nearly half of the participants being Māori. We attribute this success to the kaupapa Māori research and service approach, although we did not directly compare it with the telephone approach, as employed previously.<sup>19</sup> Despite this excellent uptake and regardless of the mode of delivery of the GRx programme there was still higher attrition of Māori than European at six months. Arguably, the very group that would have been useful to interview about attrition are those that did not complete the GRx intervention to provide insights and understanding of the barriers to participation and behavior changes.

### Health outcome measures

The reductions in weight, waist circumference, total cholesterol for both interventions, would both be associated with improvements in quality of life and morbidity.<sup>1</sup> The waist circumference reduction is particularly welcome, as it

likely reflects a reduction in intra-abdominal fat.<sup>20,21</sup> The decrease in HbA<sub>1c</sub> seen in the present study, although not statistically significant, is an important factor associated with reductions in diabetes complications in newly diagnosed type-2 diabetes<sup>22,23</sup> and for cardiovascular disease.<sup>23,24,25</sup>

One question arising from these health outcome measures is why the beneficial effects were small. Firstly, the NZPAQSF data demonstrated that the participants as a whole were extremely physically inactive (Table 1). This aspect probably contributed to the participants being heavier than those in many other studies (also BMI  $\geq 40\text{kg}/\text{m}^2$  compared to 26–34kg/m<sup>2</sup>), had raised diastolic blood pressures and elevated HbA<sub>1c</sub>. For several of these participants the GRx trial increased their levels of physical activity (especially from nothing to some brisk walking), but overall there was little change. One plausible explanation for these smaller health outcome changes may simply be the modest increase in physical activity levels achieved by the participants. This is not unexpected given that the physical characteristics along with sedentary lifestyle of these participants at baseline is likely to restrict them embarking on much physical exercise. Moreover, low intensity dynamic exercise (ie, walking and/or resistance training) has been shown to improve the blood lipid profile and physical characteristics.<sup>25,26</sup> Thus, resistance training combined with aerobic training is noted to improve glycaemic control. Secondly, direct monitoring of food choice changes did not occur. However, participant self-reports about positive nutritional changes were anecdotally reported by the facilitators and in-participant interviews, but the reliability of these reports is unknown. Thirdly, some participants were possibly on medications that may have promoted body weight gain to confound any effects of the increased physical activity levels by participants.<sup>27,28</sup>

### Strengths and weaknesses

Strengths include a high proportion of Māori, probably due to the recruitment approaches used, the complete success in translating referral (once contact made) into participation and the clear study design. A further strength is that the lipid and glycated haemoglobin measures were accessed from patient records from the general practi-

tioner rather than increasing the participant burden. The major weaknesses are the small number recruited overall, the high drop-out and that participant satisfaction is based on anecdote. The trial had intended to recruit 70 Māori and 70 New Zealand Europeans into each intervention and the final number was half this. This was due to a lower than expected eligibility rate and the limited recruitment period. The drop-out rate was largely due to the mobility of the population, not active withdrawal.

### Recommendations

The first interaction in GRx delivery should be face-to-face to improve uptake to participate (particularly among Māori), but the subsequent delivery can involve either face-to-face or telephone approaches. To make more conclusions that are robust on the relative merits of the different modes of delivery on adherence requires

an expansion of the sample size or use of a meta-analytical approach across multiple studies. Cost effectiveness should also be explored. While face-to-face delivery requires more facilitator time related to travel and organisation, there may be those that should be targeted for this more time-consuming approach (eg, those dropping out of the telephone approach). Larger improvements may occur with greater increases in physical activity associated with a longer duration of programme coupled with, and/or greater emphasis on food choices. Weekly or fortnightly GRx facilitator support rather than once a month might also improve response. In conclusion, the GRx health service appears to be equally beneficial for both Māori and New Zealand Europeans with newly diagnosed type-2 diabetes through either mode of delivery, face-to-face or telephone.

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#### Competing interests:

Nil.

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