

## Original Article

# Decisional balance and stage of change in relation to weight loss, exercise and dietary fat reduction among Pacific Islands people

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It has been postulated that changes in lifestyle follow five 'stages of change', which reflect a 'decisional balance' between the advantages and disadvantages of making such a change. We have assessed this model among Pacific Islands people in New Zealand. We questioned 105 Pacific Islands volunteers to identify their decisional balance for their reduction in dietary fat intake (DFI), weight control (WC) and the adoption of regular exercise habits (REH). Answers were used to develop a closed questionnaire, which was completed by a second group of 195 Pacific Islands volunteers. The major reported advantages were good health (45%) and increased physical attractiveness (41%) for WC; disease prevention (70%) for DFI; and increased fitness (71%) for REH. The major reported disadvantages were losing too much weight (40%) for WC; eating fatty foods was enjoyable (50%) for DFI; and the time required (47%) for REH. Major differences in responses were found by age, sex, Islands group and educational status. The derived decisional balance questions related to the stage of change with advantages outweighing disadvantages for those in the maintenance/action phases and the converse for those in the precontemplative phase. The use of this model will be helpful in evaluating long-term programs aimed at the primary prevention of non-insulin-dependent diabetes through lifestyle change.

**Key words:** type 2 diabetes, obesity, exercise, primary prevention, Polynesians, stages of change.

## Introduction

There is a high prevalence of Type 2 (non-insulin dependent) diabetes mellitus (NIDDM) among Pacific Islands people.<sup>1</sup> Primary prevention of NIDDM in such ethnic groups at high risk of diabetes may be possible with lifestyle change incorporating weight control and regular exercise.<sup>2</sup> Studies of the primary prevention of ischaemic heart disease (IHD) in whole populations have certainly demonstrated that some lifestyle changes are possible through a range of interventions incorporating both high-risk and community-based programs.<sup>3</sup> While no comparable population-based studies for the primary prevention of NIDDM have been published, studies of the impact of lifestyle change on individuals with impaired glucose tolerance have shown a reduced incidence of progression to NIDDM.<sup>4,5</sup>

Unfortunately, what is clear from these studies is that achieving the necessary lifestyle changes to increase regular exercise and control weight is very difficult from both population and individual perspectives.<sup>6</sup> It has been postulated that these major changes in lifestyle follow five principal stages,<sup>7</sup> initially developed for smoking cessation programs:<sup>8</sup>

1. Precontemplation — not considering changing behaviour.
2. Contemplation — thinking about changing.
3. Preparation — making plans to change.
4. Action — initiating behaviour change.
5. Maintenance — continuing with changed behaviour.

These 'Stages of Change' have been validated by comparison with positive and negative attitudes to the particular lifestyle change. This has been termed 'Decisional Balance'. It has clearly been demonstrated that on progressing through the

stages of change, the positive attributes of a lifestyle change increasingly outweigh the associated negative aspects. However, many of the decisional balance questions trialled in the United States are meaningless to other populations and hence, the transcultural validity of this model requires assessment. For example, Pacific Islands people hold food and the family at the centre of day-to-day living, making the 'healthy lifestyle' changes particularly difficult. Many of the key decisional balance questions appropriate for Pacific Islands people were probably not asked among American whites.

The epidemic of NIDDM among Pacific Islands people is becoming increasingly important in New Zealand.<sup>9</sup> South Auckland (population 330 000) has a particularly high proportion of Pacific Islands people (over 50 000), mainly from Samoa, Tonga, Niue and the Cook Islands. Diabetes is a major problem in the district, particularly among Pacific Islands people, and as part of a district plan, the South Auckland Diabetes Project has been developing methods for the control of diabetes.<sup>10</sup> The programme under way is being evaluated using medium-term (increased exercise, reduced prevalence of obesity) and long-term (reduced incidence of NIDDM) outcomes. However, monitoring the processes involved and the changes in attitudes that are generated is also essential to guide the programme appropriately. The aim of this study was to develop and validate 'decisional balance' and 'readiness to

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change' questions appropriate for non-diabetic Pacific Islands people in relation to weight loss, regular exercise and reducing fat content of food. These questions will then be used to assist with the evaluation of the local programme under way for the primary prevention of diabetes.

### Research design and methods

The study was conducted in two phases between November 1993 and February 1994: the aim of the first phase was to develop the decisional balance questions and the aim of the second was to validate the readiness to change questions. All interviews were conducted face-to-face by a Tongan interviewer, with a structured format according to a written questionnaire. The interviewer recorded all information given by the respondents and verbally translated the questionnaire into Tongan when necessary. A Samoan translator was also used when necessary. Analyses were conducted using SPSS for Windows (SPSS Inc, IL, USA). All tests were two-tailed and a level of  $P < 0.05$  was taken as significant.

### Selection of items and content validity: Phase 1

The first study was designed to determine the key issues in favour of ('pros') and against ('cons') the three lifestyle change scenarios (i.e. decisional balance for weight control, dietary fat reduction and regular exercise). Volunteers invited to participate were obtained from four sample groups: university students, locals of South Auckland (Mangere) aged under 30 years, the interviewer's family, and locals of South Auckland (Mangere) aged 30 years and over.

The first section of the questionnaire included demographic data such as age, sex, ethnic group (self-identity), years in New Zealand, language spoken at home, and highest level of education. The second section included open questions relating to attitudes to weight loss, reduction in dietary fat and regular exercise. For example, What do you think about losing weight?, Do you know anything good for you about losing weight?, Do you know anything bad for you about losing weight?, Is there anything that is stopping you from losing weight?. Similar questions were asked about cutting down fat and regular exercise.

The selection of items was done using two methods to determine the most important pros and cons behind each lifestyle change: a binary method (taking frequencies of all the pros and cons given to each of the three items, and then selecting the 10 most common ones) and a ranking method (taking account of not only the frequencies of the item but also the order in which the answers were given by the respondent). There was little difference in ranking when the order of answers was included in the analysis.

### Development of questionnaire

The highest ranking 'pros' and 'cons' were translated into decisional balance questions by the Tongan interviewer. It was decided that at least five questions were needed for each 'pro' and each 'con', but that as few questions as possible would be required to minimize the tiring of subjects. Similar issues were grouped such that 40 questions were eventually devised. These included seven pros and seven cons to weight loss, eight pros and six cons to dietary fat reduction, and seven pros and five cons to regular exercise. Subjects were asked to state 'yes' or 'no' to each statement and items were presented randomly in order to minimize boredom.

The new questionnaire also included the same demographic data as the first questionnaire, with the addition of three 'readiness to change' questions: 'Are you trying to reach your best weight?', 'Have you cut down the fat in your diet?' and 'Are you exercising regularly?'. Each had five possible answers (Table 1), besides the option of 'I believe I am my best weight', as a response to the weight control question.

### Subjects recruited for Phase 2

None of these subjects participated in the first study. The parish priest at a local Catholic church and the ministers at a local Tongan Methodist church and a local Pacific Island Congregational church were asked for approval to interview members of their congregations. Local volunteers were also recruited. Because of the need to assess the questionnaire among the better educated and among New Zealand-born Pacific Islands people, further subjects were included from a variety of courses at the University of Auckland. Recruitment

**Table 1.** Stages of change and overall decisional balance by gender

	Weight control		Fat reduction		Exercise	
	Male	Female	Male	Female	Male	Female
Yes, and I have been doing so for more than 6 months (Maintenance phase)	17%	27%	23%	27%	27%	29%
Yes, and I have been doing so for less than 6 months (Action phase)	13%	17%	18%	33%	26%	25%
No, but I intend to do so within the next 30 days (Preparation phase)	21%	15%	19%	19%	18%	21%
No, but I intend to do so within the next 6 months (Contemplative phase)	14%	18%	14%	11%	23%	21%
No, and I do not intend to start within the next 6 months (Precontemplative phase)	35%	22%	16%	11%	7%	4%
Total	100%	100%	100%	100%	100%	100%
Sig by $\chi^2$	NS		$P < 0.05$		NS	
Mean 'pros' to change	3.1	4.1***	6.1	6.8***	4.2	4.6***
SD	$\pm 1.8$	$\pm 1.2$	$\pm 1.6$	$\pm 1.0$	$\pm 0.9$	$\pm 0.6$
Mean 'cons' to change	3.1	2.7	2.7	2.4	2.5	2.7
SD	$\pm 1.8$	$\pm 1.9$	$\pm 1.4$	$\pm 1.4$	$\pm 1.4$	$\pm 1.4$

\*\*\* $P < 0.001$  between male and female; NS, not significant.

continued until approximately equal numbers by gender, age group, ethnic group and educational group (as defined under the first study) were obtained. In total, 195 subjects were recruited whose characteristics are shown in Table 2.

### **Reliability and validity of decisional balance questions**

The data from a computer generated random sample of 100 subjects from Phase 2 was selected to identify which of the 40 items had a minimum item discrimination coefficient (item-total correlation)  $\geq 0.20$ . This was performed overall and within each subgroup (male, female,  $< 30$  years,  $\geq 30$  years, Tongan, non-Tongan, education up to secondary school, higher education). The reliability coefficient (Cronbach's alpha) was also calculated overall and for each group. The process was then repeated, firstly with the data for the other 95 subjects to demonstrate reproducibility, and then overall.

## **Results**

### **Phase 1: Development of questionnaire**

There were 105 subjects recruited in the first phase (Table 2). Analyses were initially conducted in a randomly selected 75 cases, then the remaining 30 cases, and then overall as a means of internally validating this process. The relative ranking of the pros and cons by the three methods were compared by sex, age (above and below 30 years), ethnic group and educational status (up to secondary school education versus above secondary school education). Overall, there were 72 pros and 40 cons to weight loss, 65 pros and 24 cons to dietary fat reduction, and 79 pros and 28 cons to regular exercise.

Table 3 shows the highest ranked pros and cons once similar comments were merged. Items not within the first eight comments in both the first and second analysis are shown. Items with a lower rank but differences between important subgroups (e.g. male vs female) are also shown. While the promotion of health and prevention of disease were important 'pros', how individuals felt (e.g. 'having energy') and appearance were also important. Time, money and the pleasure associated with eating fatty foods were important 'cons' to lifestyle change. Family pressures and appearances were also

important 'cons' to lifestyle change, particularly weight loss. Some responses overlapped significantly during the interview (e.g. losing too much weight and getting sick; and worries about overdoing the exercise and injuries from exercise).

In general, if items were ranked highly overall, they were also ranked within the top eight items within gender, ethnic group, age group and educational group. However, differences in frequency of reported comments did occur between these subgroups, as shown in Table 4. Women were more likely to find cost a 'con' but weight loss a 'pro' to lifestyle change. Tongans and those from the other Islands had many differences, particularly their emphasis on the 'love' for the taste of fatty foods as a 'con' to lifestyle change but a feeling of fitness and more energy as a 'pro'. Older and younger subjects also had major differences in attitudes to lifestyle change. The less educated group were more likely to say that lifestyle change would make them less attractive while the more educated were more likely to report the opposite view.

### **Phase 2: Reliability and validity of decisional balance questions**

Two 'pros' to exercise, two 'pros' to weight loss and one 'con' to fat reduction had a low discrimination coefficient in all groups and were deleted from further analyses. Table 5 shows the results for the reliability analysis for the 35 items within the two randomly generated subsamples and overall. Cronbach's alpha was high overall and within each subgroup. However, only seven of the 35 items had an acceptable minimum item discrimination coefficient overall and in all subgroups, although all 35 items were acceptable in at least one subgroup. Table 5 also shows the number of items with an acceptable minimum item discrimination coefficient within each sample.

The sum of the 'pros' and 'cons' for each lifestyle change was calculated from the relevant items and these six sums compared between the two randomly selected samples. There were no significant differences between the two samples using a one-way analysis of variance. Taking the whole sample ( $n = 195$ ), each of these six sums was then correlated (Pearson's  $r$ ) with each of their constituent items both overall and within each of the eight subgroups. All items correlated with the relevant sum both overall ( $r = 0.30-0.79$ ,  $P < 0.001$ ) and within each of the eight subgroups ( $r = 0.20-0.83$ ,  $P < 0.05$  to  $P < 0.001$ ).

### **Relationship between demographic data, decisional balance and stages of change**

The proportion of subjects within each stage of change was similar between age, education and Islands groups. Women had significantly more 'pros' (but not 'cons') to lifestyle change than men (Table 1). More 'cons' to each lifestyle change were present among less educated than more educated subjects (all  $P < 0.001$ ), among older rather than younger subjects (at least  $P < 0.005$ ) and among Tongan rather than other Islands people (at least  $P < 0.005$ ). Older people also had more 'pros' to weight control and dietary fat reduction ( $P < 0.001$ ) than did younger subjects.

Figures 1,2,3 show the overall relationship between the 'sum of the cons', the 'sum of the pros' and the stage of change for weight control, dietary fat reduction and exercise, respectively. The 'pros' and 'cons' were converted to Z sta-

**Table 2.** Characteristics of subjects

	Phase 1 $n = 105$	Phase 2 $n = 195$
Female/male (% female)	70/35 (67%)	104/91(53%)
Age (years)	$33 \pm 14$	$32 \pm 13$
Age (range)	17-80	17-70
Tongan	58 (55%)	101 (52%)
Samoan	33 (31%)	64 (33%)
Other Polynesians	14 (14%)	30 (15%)
Speak mainly English at home	42 (40%)	87 (45%)
New Zealand born	37 (35%)	59 (30%)
Recruited through:		
College/Polytechnic	25 (24%)	101 (52%)
Family	44 (42%)	46 (24%)
Local volunteers/church	36 (34%)	48 (24%)
Education:		
Up to secondary school	52 (50%)	119 (61%)

Phase 1 was the development of questionnaire phase; Phase 2 was the validation of the questionnaire phase.

**Table 3.** Most frequently reported 'pros' and 'cons' to lifestyle change

Rank	Pros (%)	Cons (%)
	To weight loss	To weight loss
1	Become more healthy* (45)	Will lose too much (40)
2	Become more attractive* (41)	Lack of motivation* (32)
3	Will have more energy* (39)	Will get sick* (27)
4	Will prevent disease* (38)	Too expensive* (22)
5	Become more fit* (34)	Family will affect efforts* (16)
6	Become more relaxed (33)	Become less attractive* (14)
7	Have more self-confidence* (31)	Will have less energy* (11)
8	Can fit clothes better* (30)	Too busy <sup>a</sup> (9)
9		No time <sup>b</sup> (7)
10		Will put weight back on* <sup>a</sup> (7)
	To fat reduction	To fat reduction
1	Prevent disease* (70%)	Loves eating fat* (50%)
2	Become more healthy* (39%)	Miss the taste of the food* (37%)
3	Will lose weight* (39%)	Body needs fat for nutrition* (29%)
4	Have more energy* (37%)	Won't enjoy food* (28%)
5	Will become more fit* (33%)	Requires will-power* (11%)
6	Will improve eating habits* <sup>a</sup> (7%)	Fatty foods are cheaper* (8%)
7	Will improve performance* (5%)	Decided by cook (8%)
8	Improve skin <sup>a</sup> (4%)	No choice but to eat fatty food (6%)
9	Sleep better <sup>a</sup> (4%)	Feel unhappy at mealtime <sup>a</sup> (5%)
10	Improve relations with family* <sup>a</sup> (2%)	Not used to healthy food <sup>b</sup> (3%)
	To exercise	To exercise
1	Become more fit* (71%)	Takes time* (47%)
2	Have more energy* (45%)	Too busy* (37%)
3	Be more relaxed* (36%)	No motivation* (36%)
4	Be more healthy* (33%)	Worried will overdo it* (31%)
5	Lose weight (32%)	Injuries (24%)
6	Will feel good (32%)	Too tired* (19%)
7	Will prevent disease* (23%)	Family commitments (17%)
8	Be more attractive* (18%)	Medical condition (10%)
9	Have fun* <sup>b</sup> (17%)	

<sup>a</sup>Ranked in top 8 in either first 75 or second 30; <sup>b</sup>Significant difference in subgroup (e.g. ethnicity and/or sex and/or age). \*These items were used to construct decisional balance questions.

tistics to adjust for differences in numerical range. For weight control, the sum of 'pros' was higher than the sum of 'cons' for both the maintenance ( $P < 0.05$ ) and action ( $P < 0.005$ ) stages and the converse was true for the precontemplative ( $P < 0.001$ ) stage. The difference between 'pros' and 'cons' for dietary fat reduction within stage of change was only significant ( $P < 0.05$ ) for the maintenance and action stages. Decisional balance for regular exercise showed higher 'pros' than 'cons' for maintenance and action stages ( $P < 0.05$ ) and the converse for both contemplative ( $P < 0.005$ ) and precontemplative ( $P < 0.05$ ) stages.

In order to investigate whether similar patterns were found within subgroups, the standardized difference between 'pros' and 'cons' was calculated for each of the stages of change (i.e. mean Z score for 'cons' deducted from mean Z score for 'pros' within each subject). Comparisons between stages were undertaken using analysis of variance both overall and within each subgroup. Significant differences were found overall ( $P < 0.001$ ) and within all subgroups ( $P < 0.05$  to  $P < 0.001$ ) for weight control and dietary fat control. Standardized differences between 'pros' and 'cons' for regular exercise were significantly different between stages overall ( $P < 0.001$ ), within each sex and educational group ( $P < 0.05$  to  $P < 0.001$ ), for non-Tongans ( $P < 0.001$ ) and for younger

subjects ( $P < 0.005$ ). However, no significant difference was found in older subjects ( $P = 0.09$ ) or Tongans ( $P = 0.11$ ).

### Conclusions

In order to control the pandemic of NIDDM in populations at high risk of diabetes, programs need to produce sustained change in a large number of individuals. Population-based attempts at controlling risk factors for IHD have not generally been successful in reducing the proportion with obesity.<sup>3,6</sup> Indeed, in spite of the media pressures to appear slim and eat healthy food, the prevalence of obesity is increasing in the general population. Obtaining long-term increases in the proportion of the population undertaking regular exercise, reducing fat intake and controlling weight will take time prior to the identification of detectable changes in the mean weight of the population. An even longer time will be needed to demonstrate changes in the incidence of NIDDM.

With these inherent time-lags, the development of sensitive indicators of changes in attitude to lifestyle is of particular importance in helping to identify successful strategies. It is within this context that the importance of the 'stages of change' model needs to be viewed. A tool that can demonstrate movement through the stages of change continuum would be useful for monitoring the penetration and impact of community-based efforts to control obesity. However, while

**Table 4** 'Pros' and 'Cons' to lifestyle change significantly different between subgroups

Pros	Cons
Male versus female FR: Weight loss (17% vs 50%)**	WL: Too expensive (9% vs 29%)* FR: Too expensive (0% vs 11%)* FR: Not used to healthy food (9% vs 0%)*
Tongans versus other Pacific Islands people WL: Will have more energy (48% vs 28%)* WL: More self-confidence (21% vs 43%)* FR: Be fitter (43% vs 21%)* FR: Improve performance (11% vs 1%)* EX: More energy (60% vs 26%)** EX: Make more attractive (9% vs 30%)** EX: Make more relaxed (28% vs 47%)*	WL: No time (12% vs 0%)* FR: Loves eating fat (59% vs 38%)* FR: Unhappy during meals (0 vs 11%)* FR: Miss the taste of fat (52% vs 19%)** FR: Not enjoy food (38% vs 15%)** EX: No motivation (47% vs 23%)*
Aged ≤ 30 years versus 30 years WL: Become more healthy (54% vs 32%)* WL: Can fit clothes better (18% vs 46%)** WL: More self-confidence (46% vs 9%)** FR: More energy (28% vs 50%) FR: Sleep better (0% vs 9%)* EX: More energy (30% vs 66%)** EX: Make more attractive (25% vs 9%)* EX: Fun (26% vs 5%)** EX: More relaxed (44% vs 25%)*	FR: Body needs fat (41% vs 11%)** EX: Might overdo it (41% vs 16%)** EX: Make tired (10% vs 32%)** EX: Injuries (33% vs 11%)*
Educated to secondary school versus educated above secondary school FR: Prevent disease (58% vs 81%)** FR: Sleep better (8% vs 0%)* Ex: Lose weight (23% vs 42%)* EX: Make more attractive (6% vs 30%)**	WL: Look less attractive (21% vs 8%)* FR: Body needs fat (10% vs 47%)** EX: Injury (8% vs 40%)**

\* $P < 0.05$ ; \*\* $P < 0.01$ ; \*\*\* $P < 0.001$ . FR, pros and cons to 'Have you cut down the fat in your diet?'; WL, pros and cons to 'Are you trying to reach your best weight?'; EX, pros and cons to 'Are you exercising regularly?'.

**Table 5.** Reliability studies overall and within demographic subgroups (35 items)

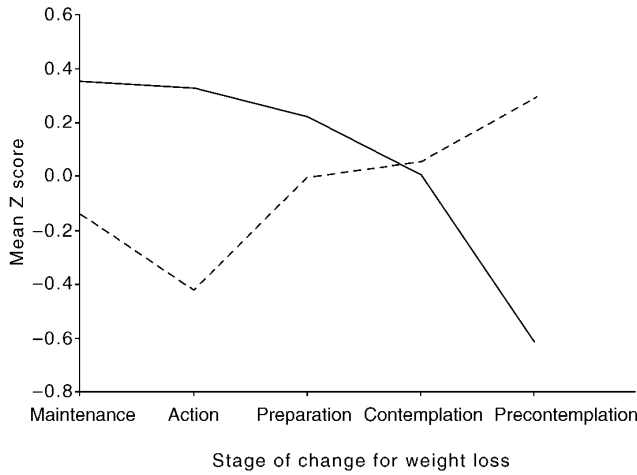
Group	First 100 subjects		Second 95 subjects		All subjects ( $n = 195$ )		
	Alpha	$n$	Alpha	$n$	Alpha	IDC Range	$n$
Overall	0.76	22	0.74	19	0.75	0.01–0.48	22
Age < 30 years	0.71	20	0.74	23	0.68	0.00–0.52	19
Age ≥ 30 years	0.60	14	0.66	22	0.69	0.00–0.46	17
Male	0.76	23	0.74	22	0.75	0.00–0.58	23
Female	0.77	25	0.71	22	0.74	0.00–0.47	20
Tongan	0.79	21	0.70	18	0.69	0.01–0.57	20
Other Islands	0.69	18	0.68	22	0.75	0.00–0.48	24
Secondary education	0.77	22	0.76	21	0.76	0.00–0.46	22
> Secondary education	0.67	20	0.66	27	0.66	0.03–0.52	21

$n$ , Number of items with an item discrimination coefficient (IDC) 0.20 or above.

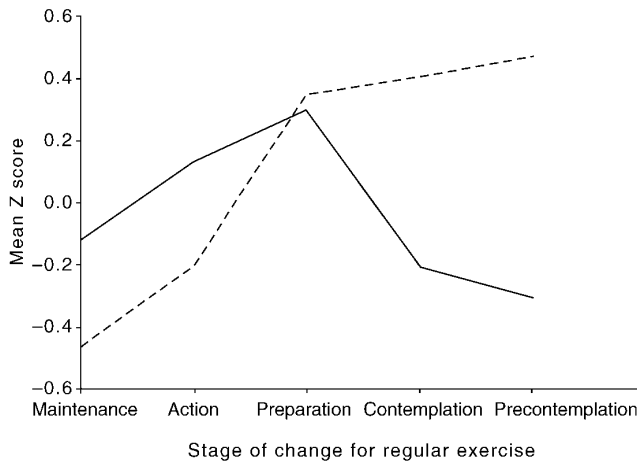
the original model was validated in relation to a range of behaviours, the study samples used may be inappropriate for assessing the utility of the tool among populations at high risk of NIDDM.<sup>7</sup> Polynesian culture and language are so different to that of those involved in many of the validation studies of the readiness to change model, that the demonstration of the validity of the three tools in this study is of particular use. While we have used the methods of Prochaska, Prochaska and DiClemente, and O'Connell and Velicer<sup>7,8,11</sup> to validate the questionnaire and many of the items were similar to those published elsewhere,<sup>11</sup> the possibility of losing too much weight, becoming less attractive when slimmer and the importance of the family in assisting or hindering lifestyle change are features that reflect Polynesian culture.

Another difference with previous studies is the heterogeneity of the study sample. The 'pros' and 'cons' of the three

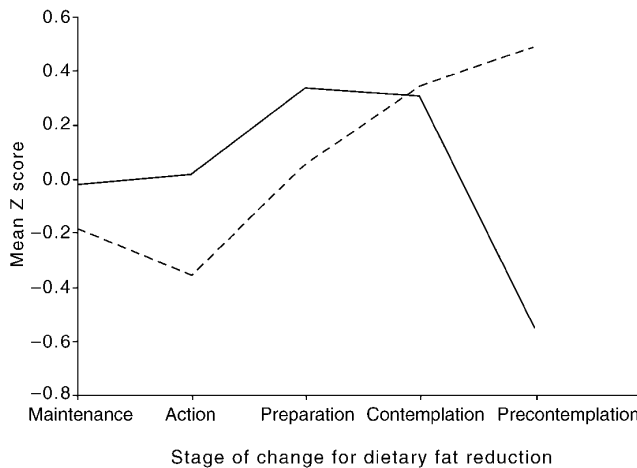
lifestyle changes differed between genders, with age, with Island of origin and with the degree of education. The greater pressure on women than men to make lifestyle changes was particularly evident. Others have also found more males than females to be in the precontemplative phase for, for example, dietary fat reduction.<sup>12</sup> This sex difference did pose a number of problems with assessing reliability of individual items. For example, the cost of healthy foods was not reported as a 'con' to dietary fat reduction overall but was reported by a significant proportion of women. It was therefore not surprising that the item discrimination coefficient was 0.34 for this item for women but < 0.20 for men. It was for this reason that items significant for any subgroup were included in the final analyses. Whether it is necessary to develop a different decisional balance questionnaire for each subgroup was an issue outside the scope of this study.



**Figure 1.** Relationship between the ‘sum of the cons’ (---) and the ‘sum of the pros’ (—) to the question ‘Are you trying to reach your best weight?’. Presented as the combined mean Z score with the stage of change for controlling weight.



**Figure 2.** Relationship between the ‘sum of the cons’ (---) and the ‘sum of the pros’ (—) to the question ‘Are you exercising regularly?’. Presented as the combined mean Z score with the stage of change for adopting regular exercise.



**Figure 3.** Relationship between the ‘sum of the cons’ (---) and the ‘sum of the pros’ (—) to the question ‘Have you cut down the fat in your diet?’. Presented as the combined mean Z score with the stage of change for reducing dietary fat intake.

The shape of the stage of change versus decisional balance graphs were of interest. All three graphs of stage of change versus cons to change showed a steady reduction in cons as stages passed from precontemplative to maintenance. However, the pros to fat reduction and regular exercise (the major methods for obtaining weight control) increased from the precontemplative to preparation stages and thereafter dropped (although not to the level of the precontemplative group). This may be due to the failure to realize some of the expected benefits of such lifestyle change (e.g. weight loss). Another possibility is that, while the ‘pros’ for progressing to the preparation stage were identified, those associated with action and maintenance were not included in the questionnaire. The latter is unlikely as 41–60% of subjects had replies from within these groups. A further possibility is that the stages of change questions were inappropriate, although these were drawn up after an extensive literature review. The observation of more ‘pros’ than ‘cons’ to lifestyle change is consistent with previous studies.<sup>7</sup>

We are currently undertaking a prospective study of the effect of lifestyle intervention upon obesity and exercise habits among 600 Pacific Islands people.<sup>13</sup> The predictive nature of these stages of change questions will be tested within intervention and control groups. While we would have preferred to relate the current study data to quantitative measurements of obesity, it was felt by our community advisers that this would have been too intrusive at that stage. We attempted to use self-reported weight, but this was unavailable for over 25% of subjects and the accuracy of those which were provided could not be confirmed.

The high proportion of subjects in the action and maintenance phases for dietary fat reduction has been reported in other studies.<sup>11,12,14</sup> It has been suggested that complex non-addictive behaviours may be inherently different to the stage of change model derived from the addictive behaviours (such as smoking). Whether this requires the identification of further categories within the maintenance and action group (e.g. according to dietary knowledge) is yet to be seen.

We have identified many ‘pros’ and ‘cons’ to lifestyle change among a Polynesian sample. These differ among different subgroups, and in particular between different Island groups. In general, the balance between these ‘pros’ and ‘cons’ was associated with stage of change questions as predicted by the ‘readiness to change’ model.

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