Comparison of stage-matched and unmatched interventions to promote exercise behaviour in the primary care setting

P. J. Naylor, G. Simmonds, C. Riddoch, G. Velleman and P. Turton

Abstract

This study examined the effectiveness of stages of change-based counselling for exercise delivered by nurses in four primary care centres. Two-hundred and ninety-four subjects enrolled, recruited from patients attending 30-min health checks. The average age of participants was 42.4 years (SD = 15.1) and 77% were female. Participants completed a questionnaire assessing stage of exercise adoption, self-efficacy and exercise levels. Each centre was assigned to either one of three experimental conditions or to a control condition. Participants were counselled accordingly, receiving either stage-oriented exercise materials with counselling (stage plus counselling), stage-oriented materials without counselling (stage no counselling), non-staged materials with counselling (counselling only) or the current level of advice (control). Sixty-one percent (n = 180) returned follow-up questionnaires. When baseline differences in self-efficacy, age and gender were controlled for, there was no significant group or interaction effect for stage. There was a significant time effect (F = 3.55, P = 0.031). Post hoc analyses showed that significant differences were between baseline and 2 (t = −3.02, P = 0.003) and 6 months (t = −2.67, P = 0.009). No changes in self-efficacy and exercise levels were observed. Stage-based interventions were not superior to the other interventions. All single-contact interventions, while having no impact on exercise behaviour and self-efficacy, did enhance motivation to change.

Introduction

Physical inactivity is a risk factor for the development of a number of chronic diseases (Blair et al., 1994). Its greatest public health impact may be as a primary risk factor for cardiovascular disease (Pender et al., 1993). Physically inactive adults have nearly twice the risk of cardiovascular disease as their regularly active counterparts, regardless of other health habits (Powell et al., 1987). Moreover, while the mean relative risk posed by physical inactivity (1.9) is comparable to that of hypertension (2.1), elevated cholesterol (2.4) and smoking (2.5) (Powell et al., 1987), physical inactivity is more prevalent in the populations of a number of developed countries (Stephens and Craig, 1990; US Public Health Service, 1991; Fentem and Walker, 1995). Incidence rates of these risk factors within the British population have been estimated for males and females, respectively, at 8 and 10.9% for hypertension, 28 and 32% for elevated cholesterol, and 28 and 26% for smoking (Office of Population Censuses and Surveys, 1994). In contrast, 64% of men and 76% of women in Britain were found to be taking insufficient exercise to achieve a health benefit (Fentem and Walker, 1995).

Interventions to influence physical activity levels in a variety of populations have met with limited success (Buxton et al., 1996). This is highlighted by the consistent finding across populations that...
50% of individuals who join a formal exercise programme drop out during the first 3–6 months (Dishman, 1988). Dishman (Dishman, 1990) emphasized the need to recognize the different transitions an individual may experience as they attempt to adopt and maintain a physical activity program. Few programs or interventions have focused on the motivational characteristics of individuals as they consider change and most are positioned for those who are ready to take action (Marcus et al., 1992).

In contrast, the transtheoretical model, otherwise known as the stages of change model (Prochaska and DiClemente, 1992), addresses motivational readiness to change a behaviour. Within this model individuals are categorized as being in one of five stages, from precontemplation (not intending to make changes) to contemplation (considering a change), preparation (making small changes), action (actively engaging in the new behaviour) and then maintenance (sticking with the changes). The model describes a dynamic process whereby individuals at different stages use different processes to consider and adopt new behaviours. Interventions specifically targeted at an individual’s stage of change are more effective in promoting that change (Prochaska et al., 1993). In addition to the five stages and related processes two other key elements have been included in a stage-based approach (Herrick et al., 1997): decisional balance (Janis and Mann, 1977) and self-efficacy (Bandura, 1977).

Research has demonstrated the model’s applicability to physical activity and other health promoting behaviours (Buxton et al., 1996). However, this approach to promoting physical activity was relatively new and evidence of the effectiveness of stage-based intervention strategies was limited. Marcus et al. (Marcus et al., 1992a) and Long et al. (Long et al., 1996) have found preliminary support for using stage-matched interventions to increase the adoption of physical activity in the community setting and the primary care setting, respectively. Both studies were pilot projects and used a pre-experimental design (one group pre-test–post-test). Marcus et al. (Marcus et al., 1992a) recruited individuals from the community to participate in a 6 week stage-based physical activity promotion program in their community. When participants completed a staging algorithm following the 6 weeks the researchers found shifts in stage and subjects were significantly more active. Long et al. (Long et al., 1996) found that when patients were interviewed following stage-oriented counselling in primary care practices they reported increases in physical activity. In structured interviews, 50% of precontemplators reported considering an exercise program while 66% of contemplators reported making the recommended change in activity levels. Seventy-five percent of active patients were encouraged to maintain their levels and 89% of those patients did so. Objective measures of physical activity levels were not used.

Two studies where stage-based interventions were conducted in the primary care setting by physicians were reported subsequently. Following the pilot by Long et al. (Long et al., 1996), a controlled trial of the same stage-based intervention was conducted targeting those patients who were in contemplation only. A significant increase in both stage of readiness to adopt physical activity and in minutes walked per week were found in the intervention condition when compared to the control condition (Calfas et al., 1996). Marcus et al. (Marcus et al., 1997) reported findings from a study of physician-based exercise counselling for patients who were 50 years or older and in the precontemplation, contemplation or preparation stages. A convenience sample of four physicians in a primary care office volunteered to participate. Analyses were conducted on 19 experimental (stage-based) and 25 control (casual care) patients. Ninety percent of individuals in the experimental condition reported being counselled about activity by their physician and two-thirds indicated that they had received an exercise prescription, whereas 32% of the controls reported having discussed physical activity, with none indicating that they had received an exercise prescription. Despite this, there were no significant differences in stage of change or physical activity levels between the groups at the 6 week follow-up. However, both groups increased their physical activity
levels and increases were greatest for patients who reported receiving more counselling messages.

The primary care practice is well-positioned to support lifestyle behaviour changes, including physical activity habits, and as such is an appropriate forum for stage-based interventions. Approximately 70% of registered patients see their GP yearly; over 3 years, the consultation rate is 90% (Jarmen, 1988). Moreover, people in Britain have indicated interested in guidance from their family doctor regarding physical activity (Wallace et al., 1987). Research has also shown that GPs have been effective in promoting behaviour change, with respect to physical activity (Kelly, 1988; Logsdon et al., 1989; Lewis and Lynch, 1993). Public health interventions delivered in the primary care setting have the further advantage of being able to target individuals not yet considering changing their exercise habits who would not voluntarily participate in, or respond to, a health promotion program or campaign.

Health promotion in this setting may be undertaken through consultations by the GP or in a structured clinic setting, where it would usually be the responsibility of practice nurses. Practice nurses are particularly well-situated in this regard. Research has demonstrated that the practice nurse has primary involvement in both the identification and management of risk factors within clinics (Cant et al., 1993). Research has also shown that practice nurses have positive attitudes toward health promotion activities (Marsh and Chew, 1984) and can be as effective as doctors in identifying risk factors (Barnes, 1983; Marsh and Chew, 1984; Kenkre et al., 1985). However, the evidence from two randomized controlled trials of cardiovascular health checks conducted by practice nurses in the primary care setting in Britain has suggested that the patient outcomes from health checks are variable and limited (British Family Heart Study Group, 1994; Imperial Cancer Research Fund OXCHECK Study Group, 1994).

Several barriers to health promotion efforts in the primary care setting have been identified including lack of standard protocols, lack of success in the counselling role and lack of appropriate training (Mann and Putnam, 1989; Mullen and Tabak, 1989; Lewis et al., 1991; Schwartz et al., 1991). Specific to British practice nurses, lack of time, space and training are major concerns (Cant et al., 1993). It has been suggested that the stages of change model provides a practitioner with guidelines which enhance their ability to help individuals progress along the continuum of change (Samuelson, 1997). If practice nurses have adopted a patient-centered approach, the stages model provides a method of assessment and information about appropriate strategies for change based upon each individual patient’s motivational readiness. As Samuelson (Samuelson, 1997) emphasized, the model provides the practitioner with the language to describe, discuss and assist individuals.

Prior to the implementation of this research project there were no controlled trials of a stages of change-based counselling approach to increasing exercise behaviour described in the literature. Investigations of the utility of the model for promoting physical activity were reported for two uncontrolled trials: one delivered in the community and one delivered by physicians in the primary care setting. Of two subsequent controlled trials, only one found differences between the intervention group and the controls, and this study limited their intervention to patients who were in contemplation. Concurrently, practice nurses were assuming responsibility for preventive health in the British primary care setting and there was no research examining the use of a stage-based interventions in this context. Therefore, it was the purpose of this study to examine the effectiveness of stages of change-based counselling for exercise, delivered by the practice nurse in a primary care setting using a controlled trial. Further, previous research has suggested that stage of change, physical activity levels and self-efficacy may be related (Marcus et al., 1992b), and these relationships may help to explain behaviour change. We therefore also sought to investigate such relationships in this study. Given the paucity of evidence null hypotheses were tested.
Methods

Subjects
A convenience sample of four general practices in Bristol, England were approached by Look After Your Heart–Avon to participate in a primary care physical activity promotion pilot study. Participation was voluntary and based upon the understanding that the proposed intervention would be designed to fit within the resource constraints and practice protocols that existed. Subjects were then recruited from all patients attending health checks in one of the four general practices, either by self-referral or by referral from the GP. Participation by individual patients within each practice was voluntary. Two-hundred and ninety-four subjects agreed to participate. The average age of participants was 42.4 years (SD = 15.1) and 77% were female. One-hundred and eighty subjects returned follow-up questionnaires at 2 months and were therefore included in the analyses.

Design
Participating primary care practices were non-randomly assigned by the research officer to either one of three experimental conditions or a control condition. Random assignment to treatment was limited by clinician preference and prior knowledge of the stages of change model. Although the clinicians were blind to the true nature of the interventions, after agreeing to participate, some clinicians expressed a reluctance to be allocated to the control condition. This phenomenon has been described by Torgerson and Sibbald (Torgerson and Sibbald, 1998). The practice which did not indicate a strong expectation was allocated to the control condition. In addition, one practice nurse had been introduced to the transtheoretical model prior to the study and the practice in which she worked was assigned to a stage-based protocol to avoid contamination. The three experimental conditions were stage-oriented exercise materials with counselling (stage plus counselling), stage-oriented exercise materials without counselling (stage no counselling) and non-staged materials with counselling for exercise (counselling only).

<table>
<thead>
<tr>
<th>Condition</th>
<th>No. of nurses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage with counselling</td>
<td>3</td>
</tr>
<tr>
<td>Stage with no counselling</td>
<td>3</td>
</tr>
<tr>
<td>Counselling only</td>
<td>5</td>
</tr>
<tr>
<td>Control</td>
<td>2</td>
</tr>
</tbody>
</table>

*aOne nurse went on medical leave during the study*

The control condition (control) continued with current levels of exercise advice.

Practice nurses and reception staff from each practice were trained prior to implementation. The numbers of nurses trained from each practice are shown in Table I. When patients attended a health check with a practice nurse they were asked by reception staff if they were willing to participate. An informed consent and baseline data on stage of change for exercise adoption, current exercise levels, self-efficacy for exercise and demographics were collected. Upon receipt of the completed questionnaire, reception staff or the practice nurse provided the patient with the information package appropriate for the practice intervention condition and their stage of exercise adoption. Practice nurses then conducted a 30-min health check that included approximately 5 min for advice on exercise. Post-intervention measures were collected by a postage-paid mail questionnaire at 8 and 24 weeks.

Training
Training was conducted with the primary care practice nurses and reception staff at each of the participating general practices. Training sessions were 2 h in length and varied according to the experimental condition the practice was assigned to. Each session included information about the health benefits of exercise, safety considerations, basic counselling and motivation techniques, and procedures related to implementation. The stage-based practices also received information about the stages of change model and stage-appropriate strategies. Control condition staff received training on practice procedure related to collecting data with no associated exercise counselling information.

Table 1. Number of nurses trained in each primary care practice (n = 13)
Appropriate written training materials were provided for all staff. Practice staff were encouraged to make suggestions about practice procedures that would enhance delivery of the intervention and respond to practice needs. The practices were visited weekly to collect data and discuss areas of improvement.

Material development

Written materials were adapted from previously developed American stage-based intervention materials (Marcus et al., 1992a; Patrick et al., 1994). Booklets were developed for the precontemplation, contemplation, preparation and action stages. Maintenance strategies were included in the action booklet. Counselling and written materials incorporated the cognitive and behavioural processes associated with each stage. Following adaptation, the materials were tested for readability. No materials higher than a Grade 6 reading level on the Flesch–Kincaid Grade level readability test were accepted. Materials were then reviewed by a selection of health promotion practitioners and members of the general public for acceptability. Each booklet was comprised of a folded A4 sheet with a single A5 worksheet inserted. The activity on the worksheet was a resource to be used during the health screen or at home by the patient. Each booklet was colour coded to identify the relevant stage. Brighter colours were selected to catch the attention of those in the earlier stages while milder colours were used for later stages.

Intervention protocol

A single-contact intervention was selected in consultation with the primary care teams who identified this as practical within the confines of their current practice. All patients completed the Physical Activity Readiness Questionnaire (PARQ) prior to exercise counselling. Approximately 5 min was allowed for exercise advice.

Patients in the non-staged intervention received general advice about the frequency, intensity, time, type of exercise and common motivational techniques. In addition, they were provided with written materials about physical activity opportunities in their area, an action planner which allowed them to write down their activities, record participation and plan rewards, and a reduced rate leisure centre pass.

Patients in the stage-based counselling intervention were given one of the four stage-based booklets according to their individual stage of exercise adoption. Counselling and written materials incorporated the cognitive and behavioural processes that are utilized at each stage. An action planner was included to complement the preparation and action/maintenance materials. An information sheet of activities in the area and a reduced rate leisure centre pass was provided for all stages with the exception of precontemplation.

Patients in the stage-based intervention with no verbal counselling received one of the four stage-based booklets according to their individual stage of exercise adoption. However, stage-based counselling for exercise was not provided. As in the other stage-based intervention an action planner was provided for those in preparation or action/maintenance, and an information sheet and a reduced rate leisure centre pass were provided for individuals in contemplation, preparation and action/maintenance stages.

Patients in the control condition were advised about exercise according to current practice standards. Prior to the current intervention, primary care practices in Avon utilized a coronary heart disease prevention programme based upon the work of Fullard et al. (Fullard et al., 1987). This health check protocol included asking patients about their physical activity habits and coding their replies on a scale of 1–3, where 1 was inactive and 3 was active (3 times/week for 20 min). Further advice about exercise was dependent on the patient’s exercise status and was at the discretion of the practice nurse. Control practice nurses were asked not to change their usual practice during the intervention period.

Instruments

Subjects completed a questionnaire upon entry into the study, and again at 8 and 24 weeks following
intervention. The questionnaire included questions about demographics, the individuals reason for attending the health check, and measures of stage of exercise behaviour, exercise self-efficacy and self-reported exercise levels.

**Stage of Exercise Behaviour Scale (SEBC)**

The SEBC requires the subject to choose which of five statements best describes their current exercise pattern. Each of the statements corresponds to one of the stages of change from precontemplation to maintenance. Each stage was assigned a numeric value on a five-point continuous scale, with 1 representing the lowest level of readiness to change (precontemplation) and 5 representing the highest readiness to change (maintenance). Concurrent validity for the scale has been demonstrated with a Seven Day Recall Physical Activity Questionnaire (Marcus and Simkin, 1993). A $\kappa$ index of reliability of 0.78 ($n = 20$) over a 2 week period has been reported (Marcus et al., 1992a).

**Exercise self-efficacy**

The Exercise self-efficacy scale is comprised of 5 items related to barriers to regular participation (weather, bad mood, tiredness, holidays and time). The scale requires the subject to rate their confidence in their ability to participate on a seven-point Likert scale in relation to these barriers. The instrument has a reported test–retest reliability of 0.90 ($n = 20$) over a 2 week period (Marcus et al., 1992a).

**Activity Assessment Questionnaire (AAQ)**

The AAQ was a 7 day physical activity recall adapted for adults from the Northern Ireland Children’s Health and Fitness Survey (Riddoch et al., 1990). The AAQ required the subject to recall their exercise starting with the same day 7 days ago. Time markers were used to increase the accuracy of recall (morning, lunch time, etc.). For each activity listed, the subject completed a section asking how often, how long and how intense their exercise bouts were. A weekly physical activity energy score was calculated from time spent in various activities and standard metabolic values (METS) for those types of activities. Metabolic values were set at 3.5 for light activities, 5.5 for moderate activities and 7.5 for vigorous activities.

**Statistical analysis**

The statistical analyses were carried out in two stages. Non-parametric techniques were conducted in the initial stage based upon the following parameters: the level of measurement was ordinal, there was no random assignment, there were large differences in sample size and some of the data was skewed. However, when significant differences in age, gender and self-efficacy were found between groups at baseline a second stage of parametric analyses was conducted. The use of parametric tests can be valid if assumptions are violated when they provide valid estimates of the results of non-parametric tests (May et al., 1990).

**Phase 1**

Kruskal–Wallis one-way analysis of variance (ANOVA) was used to determine if any significant differences in stage of change for exercise, exercise levels and self-efficacy were present among the groups at baseline. A one-way ANOVA was used to determine if any significant difference in age existed among the groups at baseline and a $\chi^2$ test of association was used to determine if there was a significant relationship between group and gender. Within-group differences across time were assessed initially using Friedman’s two-way repeated measures ANOVA and post hoc Wilcoxon matched-pairs, signed-ranks tests.

**Phase 2**

Repeated measures ANOVA within groups comparisons were used to determine if the parametric analyses approximated the results of the non-parametric. When similarities between the results were found a mixed design repeated measures analysis of covariance (ANCOVA) was used to determine if the groups differed over time on the dependent variables after the effects of age, gender and self-efficacy were removed.

Subjects in contemplation and preparation and
Stage-matched and unmatched exercise advice

Four General Practices

<table>
<thead>
<tr>
<th>Treatment Group 1:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage-based materials plus verbal counselling</td>
</tr>
<tr>
<td>n=178</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Treatment Group 2:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage-based materials only.</td>
</tr>
<tr>
<td>n=39</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Treatment Group 3:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-staged exercise advice.</td>
</tr>
<tr>
<td>n=36</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control Group:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status quo health check</td>
</tr>
<tr>
<td>n=41</td>
</tr>
</tbody>
</table>

Single point of contact with practice nurse (approximately 5 minutes)

8 weeks  113 n= 22 n= 21 n= 24
24 weeks  83 n= 18 n= 12 n= 15

Fig. 1. Responses for each treatment condition and testing period including subjects in the maintenance stage.

maintenance were also analysed separately to determine if differences in physical activity levels were present across time for individuals in these specified stages and for individuals in these stages who demonstrated an increase in stage following intervention. Finally, drop-out and percentages of subjects either maintaining, progressing or regressing a stage at each testing period were calculated for each treatment group and the χ² test of association was used to determine if this was associated with the intervention.

Results

Descriptives

Two-hundred and ninety-four subjects with a mean age of 42.4 years (SD = 15.1) agreed to participate in the study. Of these, 68 subjects were males and 226 were females. One-hundred and eighty returned follow-up questionnaires at 8 weeks, representing 61% of the sample. One-hundred and twenty-eight subjects returned follow-up questionnaires at 24 weeks, a response rate of 44%. The number of responses for each treatment group at each testing period are shown in Figure 1.

The percentage of subjects in each stage of change for exercise at baseline is described in Table II. Baseline levels of stage, self-efficacy, age, gender and exercise levels are shown in Table III. Kruskal–Wallis one-way ANOVAs indicated that there were no significant differences in stage of change and exercise levels across treatments groups prior to intervention. However, there were significant differences in age and self-efficacy, and a significant association between gender and treatment condition (see Table IV). The stage plus counselling and the general counselling groups had significantly higher self-efficacy, were younger and comprised of more females at baseline than the control and stage no counselling groups.

Stage of change

Repeated measures ANCOVA showed that age and gender were not significant covariates for stage of change. Self-efficacy was a significant covariate for stage of change \((F = 11.7, p = 0.001)\). When baseline differences in self-efficacy were controlled for there was no significant main effect for group or any interaction between group and time. There was a significant difference in stage of change over time (see Table V). Post hoc analyses showed that there were significant differences between
Table II. Distribution of the sample across the stages of change at baseline

<table>
<thead>
<tr>
<th>Stage of change for exercise</th>
<th>Description</th>
<th>n</th>
<th>Percentage of sample in each stage for exercise overall (n = 294)</th>
<th>SWC a</th>
<th>SNC b</th>
<th>CO c</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precontemplation</td>
<td>Not currently active and not intending to become active</td>
<td>5</td>
<td>1.7</td>
<td>1.1</td>
<td>2.6</td>
<td>0</td>
<td>4.9</td>
</tr>
<tr>
<td>Contemplation</td>
<td>Not currently active but have considered becoming more active</td>
<td>29</td>
<td>9.8</td>
<td>13.5</td>
<td>2.6</td>
<td>5.6</td>
<td>4.9</td>
</tr>
<tr>
<td>Preparation</td>
<td>Not currently active but planning on becoming active in the next 30 days/participate in some activity but not regularly</td>
<td>101</td>
<td>34.4</td>
<td>32.6</td>
<td>35.9</td>
<td>30.6</td>
<td>43.9</td>
</tr>
<tr>
<td>Action</td>
<td>Currently active but have been for less than 6 months</td>
<td>48</td>
<td>16.3</td>
<td>15.7</td>
<td>30.8</td>
<td>13.9</td>
<td>7.3</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Currently active and have been for more than 6 months</td>
<td>111</td>
<td>37.8</td>
<td>37.1</td>
<td>28.2</td>
<td>50.0</td>
<td>39.0</td>
</tr>
</tbody>
</table>

a Stage with counselling.
b Stage with no counselling.
c Counselling only.

Table III. Stage of change, self-efficacy, age, gender and activity levels at baseline

<table>
<thead>
<tr>
<th>Group</th>
<th>Stage of change</th>
<th>Self-efficacy</th>
<th>Age</th>
<th>Total activity a</th>
<th>Ratio of males</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Stage with counselling</td>
<td>3.74</td>
<td>1.13</td>
<td>19.72</td>
<td>9.64</td>
<td>42.08</td>
</tr>
<tr>
<td>Stage no counselling</td>
<td>3.79</td>
<td>0.99</td>
<td>14.69</td>
<td>9.17</td>
<td>46.03</td>
</tr>
<tr>
<td>Counselling only</td>
<td>4.08</td>
<td>1.02</td>
<td>21.37</td>
<td>7.79</td>
<td>35.06</td>
</tr>
<tr>
<td>Control</td>
<td>3.71</td>
<td>1.19</td>
<td>16.85</td>
<td>10.04</td>
<td>50.73</td>
</tr>
</tbody>
</table>

a Total activity = minutes weighted by intensity ratings.

Table IV. Differences in dependent measures between groups at baseline

<table>
<thead>
<tr>
<th>Variable</th>
<th>Test</th>
<th>Test statistic</th>
<th>Level of significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage of change</td>
<td>Kruskall–Wallis</td>
<td>$\chi^2 = 2.91$</td>
<td>$P = 0.4054$</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>Kruskal–Wallis</td>
<td>$\chi^2 = 13.36$</td>
<td>$P = 0.0003$</td>
</tr>
<tr>
<td>Age</td>
<td>ANOVA</td>
<td>$F = 6.04$</td>
<td>$P &lt; 0.000001$</td>
</tr>
<tr>
<td>Gender</td>
<td>$\chi^2$</td>
<td>$\chi^2 = 27.74$</td>
<td>$P = 0.2497$</td>
</tr>
<tr>
<td>Total activity</td>
<td>ANOVA</td>
<td>$F = 1.38$</td>
<td>$P = 0.160$</td>
</tr>
<tr>
<td>Duration of activity</td>
<td>ANOVA</td>
<td>$F = 1.74$</td>
<td>$P = 0.4267$</td>
</tr>
<tr>
<td>METS</td>
<td>ANOVA</td>
<td>$F = 0.93$</td>
<td>$P = 0.672$</td>
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</table>

baseline levels of stage and levels of stage at both 2 ($t = -3.02$, $P = 0.003$) and 6 months ($t = -2.67$, $P = 0.009$) following the interventions. There was no difference between the 2 month measure and the 6 month measure ($t = 0.425$, $P = 0.672$).

Overall, 25% of the sample who completed the first post-test advanced at least one stage, 64% maintained their initial stage and 11% regressed. This pattern was consistent from baseline to the second post-test where 20% advanced, 64% maintained and 16% regressed. There was no significant association between intervention condition and the overall pattern of advancement, maintenance or regression in stage.

Attrition rates were not associated with stage of
Stage-matched and unmatched exercise advice

Table V. Results of repeated measures ANCOVAs

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Group effect</th>
<th>Time effect</th>
<th>Interaction effect</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>P</td>
<td>F</td>
</tr>
<tr>
<td>Stage of change</td>
<td>0.81</td>
<td>0.494</td>
<td>3.55</td>
</tr>
<tr>
<td>Total activity</td>
<td>0.86</td>
<td>0.463</td>
<td>1.24</td>
</tr>
<tr>
<td>Duration of activity</td>
<td>0.94</td>
<td>0.424</td>
<td>2.68</td>
</tr>
<tr>
<td>METS</td>
<td>0.93</td>
<td>0.430</td>
<td>1.64</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>2.72</td>
<td>0.054</td>
<td>0.60</td>
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</table>

Table VI. Attrition rates for each treatment condition across testing periods

<table>
<thead>
<tr>
<th>Treatment condition (n = baseline)</th>
<th>Attrition (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8 weeks</td>
</tr>
<tr>
<td>Stage with counselling (n = 178)</td>
<td>37</td>
</tr>
<tr>
<td>Stage with no counselling (n = 39)</td>
<td>44</td>
</tr>
<tr>
<td>Counselling only (n = 36)</td>
<td>42</td>
</tr>
<tr>
<td>Control (n = 41)</td>
<td>41</td>
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change at baseline and ranged from 37 to 44% at 8 weeks and from 53% to 67% at 24 weeks (see Table VI).

Physical activity levels

There were no significant main effects for group or time nor were there any significant interaction effects for measures of physical activity (total physical activity, duration or METS) (see Table V). The repeated measures ANCOVA showed that changes in physical activity levels were not significantly associated with baseline differences in self-efficacy, age or gender. When those individuals in contemplation, preparation or maintenance were analysed separately there were again no significant differences in any measures of physical activity across time. In addition, those subjects who had advanced a stage demonstrated no significant difference in physical activity levels.

Self-efficacy

Self-efficacy scores at month 2 and month 6 were not significantly associated with baseline differences in age or gender. There was no signif-

Discussion

Limitations

When interpreting the results of this study a number of limitations need to be considered. Foremost is the lack of a control condition where the patient completed the assessments but had no contact with a practice nurse. As a result, the influence of the pre-test on post-test measures (practice effect) and on the patients’ motivation to exercise (Hawthorne effect) could not be ruled out. Secondly, the lack of random assignment of practices to treatment condition and the convenience sampling procedures used to recruit patients increased the possibility of bias. Thirdly, although May et al. (May et al., 1990) make a case for the use of parametric analyses when these analyses approximate the results of non-parametric tests, the data did violate a number of the assumptions of parametric multivariate tests. Caution should be used when interpreting the results because there was unequal group sizes, non-random assignment, skewed data, and the use of nominal and ordinal level measurement. For example, stage of change, which was measured on an ordinal scale, showed less variability than exercise levels which were measured at the interval level. Differences in variability may impact on the ability to demonstrate differences for some variables.
Fourthly, access to patient files by our non-medical research team was not granted during this study. This prevented more detailed profiling of participants and non-participants. Finally, this was field research not a clinical- or laboratory-based trial. The interventions and data collection procedures were designed to accommodate a number of practical constraints within the selected practices: limited staff time, limited resources, limited patient time and protection of patient confidentiality. The practical nature of this study limited both the extent of the data collection and the treatment dose which increased the risk of a Type II error.

**Demographics**

The demographics of the sample studied in this controlled trial were comparable to those reported in other studies where stage-oriented physical activity interventions were used; with the mean age of the samples being approximately 40 years and predominantly women (Marcus *et al.*, 1992a; Calfas *et al.*, 1996). Although gender was not a significant covariate for any of the dependent measures, the gender bias of the sample should be noted when considering the impact of the intervention.

Gender differences in exercise preferences have been demonstrated previously. Studies conducted by Hovell *et al.* (Hovell *et al.*, 1989) and the Canadian Fitness and Lifestyle Research Institute (Canadian Fitness and Lifestyle Research Institute, 1996) indicated that women preferred moderate forms of exercise while males tended to select more vigorous modes. The messages used in the intervention materials reflected the current shift from a fitness prescription; structured vigorous exercise which results in a training effect, to a health prescription of moderate activity accumulated over a day. Therefore, the counselling and materials may be more appropriate for a female population.

None of the previous stage-based intervention studies involved individuals identified to be in the maintenance stage, however, making other demographic comparisons difficult. Nonetheless, when subjects in the maintenance stage were removed, the proportion of the current sample in the pre-contemplation stage, approximately 3%, was similar to the findings of Long *et al.* (Long *et al.*, 1996) where 5% were categorized as pre-templators. Beyond this the sample composition appeared to differ, with approximately 16% of the present sample categorized as contemplators compared to 61 and 50% in the Long *et al.* (Long *et al.*, 1996) and the Marcus *et al.* (Marcus *et al.*, 1997) study, respectively. Calfas *et al.* (Calfas *et al.*, 1996) selected only patients in contemplation and therefore comparisons were not possible.

The present study was similar to several other exercise-based studies in that it showed higher distributions in the preparation and maintenance stages than in the action stage, and lower distributions in the precontemplation and contemplation stages (Buxton *et al.*, 1996). Some of the differences across studies may relate to recruitment and sampling strategies. Participation in this study was voluntary, and therefore low participation by those in the earlier stages and higher participation rates from those in the later stages could be expected.

**Stage of change**

The findings of this research showed that all of the treatment conditions including the control condition resulted in an increase in motivational readiness to exercise (stage of change). This finding contrasts with those of Marcus *et al.* (Marcus *et al.*, 1997) where no significant differences in stage were found after a short stage-based approach used with seniors was compared with a control condition. It also contradicts the findings of Calfas *et al.* (Calfas *et al.*, 1996) where significant differences in stage were found between contemplators in a control condition and those who received a stage-based intervention in the primary care setting. It is important to note that our study did find that staged approaches resulted in a shift in stage but it did not find them superior to the general or control condition. The differences between our findings and those of Calfas *et al.* (Calfas *et al.*, 1996) may be attributable, in part, to the nature of our control condition where a basic level of intervention was already occurring as a component of the health check.
When comparing the pattern of change in this study with previous research we found that the shifts in stage over time were comparable to the patterns found by Marcus et al. (Marcus et al., 1996), where 26% of their worksite health promotion project sample advanced a stage, 15% regressed or relapsed and 59% were stable over time.

**Attrition**

Attrition rates in this study were somewhat higher than would be predicted from previous research on structured exercise programs (Dishman, 1988), ranging from 37 to 44% at 8 weeks and from 53 to 67% at 24 weeks. However, the intervention dose (5 min) and the follow-up (mail survey with no reminders) were minimal in comparison to previously reported structured exercise interventions (Martin et al., 1984; Belisle et al., 1987; Marcus, 1988; Noland, 1989; Naylor, 1992). The attrition rates in this study were also higher than the 16.9% reported by Calfas et al. (Calfas et al., 1996) who used a similar clinic contact time of 5 min. The difference might be explained by the inclusion of a booster call and mailed educational sheets in their intervention, and a shorter follow-up period (4–6 weeks). We do know, however, that attrition in this study was not related to baseline stage, self-efficacy, age or gender. Since assessing the reasons for attrition was beyond the scope of this study it was also impossible to determine if attrition represented a failure to exercise or simply a survey non-response.

**Physical activity levels**

Significant changes in stage of change did not result in concomitant changes in physical activity levels. When those in the contemplation and preparation stages, who would be expected to increase their activity and efficacy levels, and those who had increased a stage were analysed separately there were also no significant differences. These findings may reflect limitations in the sensitivity of the self-report scales used, lack of statistical power or the minimal impact of a 5 min intervention. In contrast, they may also reflect limitations of the model itself. Although several previous studies have validated the model against objective measures of fitness and physical activity (Cardinal, 1995; Marcus and Simkin, 1993), these findings do not support the presence of a causal relationship between stage and physical activity level.

The findings of this study are similar to those of Marcus et al. (Marcus et al., 1997) which showed no differences in activity levels between intervention and control conditions. In fact, their research highlighted the importance of the intervention dose. In our study, as in the former, the minimal intervention protocol had a limited impact. A staged approach (written or verbal) did not overcome the limitations of interventions in the primary care setting which have been found by other researchers (Family Heart Study Group, 1994; Imperial Cancer Research Fund OXCHECK Study Group, 1995).

These findings do differ from those of Calfas et al. (Calfas et al., 1996) who found significant increases in both stage of change and physical activity levels when physical activity was measured by walking and accelerometer scores. Notably, these researchers also found no significant increase in physical activity when measured by 7 day recall. This suggests a possible lack of instrument sensitivity to light to moderate increases in physical activity as advocated in the intervention materials, such as ‘Walking or cycling instead of taking the car’ and ‘Playing with the children.’ Alternatively, the difference between the findings of this study and those of Calfas et al. (Calfas et al., 1996) may relate to the differences in the intensity of the interventions or the type of health professional delivering the intervention. Calfas et al. (Calfas et al., 1996) used booster calls and additional educational materials, and their programme was delivered by physicians.

Significant relationships between physical activity and stage of change have been demonstrated in previous research (Marcus and Simkin, 1993; Cardinal, 1995), and evidence of a causal relationship between an increase in stage of change and measures of physical activity is suggested by
the findings of Calfas et al. (Calfas et al., 1996). The findings of this research do not support the presence of such a relationship.

**Self-efficacy**

Significant changes in stage of change did not result in concomitant changes in self-efficacy levels. Although, verbal persuasion has been cited as one of the factors which influences self-efficacy (Bandura, 1977) the 5 min verbal intervention plus materials used in this study had no significant influence on exercise self-efficacy at 8 or 24 weeks. This finding is supported by the findings of Calfas et al. (Calfas et al., 1997) which also showed no significant change in exercise self-efficacy at 4–6 weeks post-intervention. It appears that the influence of short verbal interventions, accompanied by written materials, on exercise self-efficacy is negligible or transitory. It is possible that the other proposed influences on self-efficacy such as mastery, vicarious experience and physiological arousal (Bandura, 1977) had more impact on exercise self-efficacy than the intervention. In the research by Calfas et al. (Calfas et al., 1997) cognitive and behavioural processes did change in response to their intervention, highlighting the possibility that the materials and counselling messages used in both studies may have been more suited to influencing these variables. A significant positive correlation between self-efficacy and stage of change for exercise behaviour has been found previously (Marcus et al., 1992b). Again, the findings of this study provide no support for the presence of a causal relationship between stage and self-efficacy.

**Conclusion**

In summary, this study demonstrated that a stage-oriented counselling approach was not superior to other interventions of similar intensity in the primary care setting. The pragmatic nature of this trial, where there was no assessment of patients who were not attending a health check and the pre-existing protocol for health checks included a minimal level of discussion about physical activity, made it difficult to establish a true control condition and therefore determine if the interventions were better than no intervention at all or to rule out the influence of the pre-test. What our findings did indicate is that when a patient attended a health check where physical activity was measured or discussed in any format there was a shift in their motivational readiness to exercise following the discussion.

The failure of this study to demonstrate concomitant changes in physical activity levels could be related to differences in the sensitivity of the physical activity measurement instrument used or to differences in the intensities of the interventions. Conversely, the fact that this approach did not achieve behaviour change may suggest that it cannot resolve the previously identified limitations of minimal dose interventions in the primary care context.

Future research on the effectiveness of stage-based approaches should consider increasing the intensity of the intervention and utilizing specific physical activity instruments which are sensitive to small shifts in light to moderate physical activity, such as walking. Further research, in the primary care setting specifically, should examine the influence that follow-up contact and the type of health professional (nurse or GP) delivering the intervention may have on readiness to adopt physical activity and actual physical activity levels.

**Acknowledgements**

This research was funded and supported by Look After Your Heart–Avon. The authors would like to thank all those people who made the study possible. In particular, our thanks go to all of the staff at the Courtside Surgery, Yate Health Centre, Kennedy Way Surgery, The Surgery on Wellington Road and the Yate Leisure Centre. In addition, the authors would like to thank James Sallis and Bess Marcus for generously sharing their materials with the University of Bristol Exercise and Health Research Unit.
Stage-matched and unmatched exercise advice

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