

# The Impact of Behavioral Counseling on Stage of Change in Fat Intake, Physical Activity, and Cigarette Smoking in Adults at Increased Risk of Coronary Heart Disease

## ABSTRACT

**Objectives.** This study assessed stages of change in fat intake, physical activity, and cigarette smoking during a randomized controlled trial of behavioral counseling.

**Methods.** Twenty general practices (primary health care centers) were randomized to lifestyle counseling by behavioral methods or to usual health promotion. A total of 883 patients were selected for the presence of 1 or more of the following risk factors: cigarette smoking, high cholesterol, or a combination of a high body mass index and low physical activity. Stage of change (precontemplation, contemplation, preparation, and action/maintenance) was assessed at baseline and after 4 and 12 months.

**Results.** The odds of moving to action/maintenance for behavioral intervention vs control patients at 4 months were 2.15 (95% confidence interval [CI]=1.30, 3.56) for fat reduction, 1.89 (95% CI=1.07, 3.36) for increased physical activity, and 1.77 (95% CI=0.76, 4.14) for smoking cessation. The likelihood of achieving action/maintenance was related to baseline stage for all 3 behaviors.

**Conclusions.** Brief behavioral counseling based on advice matched to stage of readiness for change may be valuable in encouraging healthy lifestyles among patients in primary care at raised risk of cardiovascular disease. (*Am J Public Health*. 2001;91:265–269)

Andrew Steptoe, DSc, DPhil, MA, Sally Kerry, MSc, Elizabeth Rink, MSc, and Sean Hilton, MD, MBBS, FRCGP

Encouraging smoking cessation, dietary fat reduction, and regular physical activity is a central element of cardiovascular disease prevention through lifestyle change.<sup>1</sup> The stage of change model has become increasingly influential as a framework for understanding health-related behavior and directing efforts in health promotion.<sup>2,3</sup> The model postulates that individuals can be allocated to different stages of readiness for change (from precontemplation through contemplation, preparation, and action to maintenance of successful change) and that baseline stage is a predictor of behavior change.<sup>4,6</sup>

The stage of change framework suggests that intervention programs might be tailored to the individual's stage of readiness. The Change of Heart Study is a randomized controlled trial that compares brief behavioral counseling with usual health promotion advice among patients at increased risk of coronary heart disease in a primary care setting,<sup>7</sup> where there is limited evidence regarding the effects of stage-oriented programs.<sup>8–10</sup> The behavioral and biological risk factor results of this study, which have been described elsewhere, show greater reductions in fat intake and the number of cigarettes smoked and greater increases in physical activity in the behavioral intervention group than in the control group at 4 and 12 months.<sup>11</sup> In this article, we present stage of change outcomes in the study and address (1) whether behavioral intervention was more effective than normal practice in achieving the target stage (action/maintenance), (2) whether the likelihood of achieving the target stage for each behavior varied with initial stage, and (3) whether any advantage of behavioral intervention was equally evident for patients at different stages of readiness at baseline.

## Methods

### Study Design

This randomized trial involved 20 general practices (primary care centers), half al-

located to behavioral intervention and half to control conditions.<sup>7</sup> Patients with 1 or more of the following modifiable risk factors were recruited: regular cigarette smoking (more than 1 cigarette per day), high cholesterol (6.5–9.0 mmol/L), or a combination of high body mass index (BMI; 25–35 kg/m<sup>2</sup>) and low physical activity (fewer than 12 episodes in the past 4 weeks of vigorous or moderate exercise lasting 20 minutes). Patients were excluded if they were on active follow-up or medication for coronary heart disease, had a history of cardiovascular disease, had a serious chronic illness, or were prescribed a special diet or lipid-lowering drugs. One nurse from each of the 10 intervention practices was trained in behavioral counseling based on the stage of change model, which was adapted from the “Helping People Change” program devised by the UK Health Education Authority.<sup>12</sup> Nurses were trained by experienced psychologists and health educators (1) to assess a patient's readiness to change behavior and (2) to use attitude change, goal setting, and specific behavioral advice to stimulate modifications in behavior.<sup>13</sup>

Following recruitment and baseline assessment, patients were counseled in dietary fat reduction if they had elevated cholesterol and in increasing physical activity if they were sedentary and had a high BMI, while smokers were counseled in cessation with nicotine replacement when appropriate. Patients in the behavioral intervention group were invited for 3 counseling sessions if they had 2 risk factors and for 2 counseling sessions if they had only 1 risk factor. Nurses in the control practices employed

At the time of the study, the authors were with St George's Hospital Medical School, University of London, London, United Kingdom.

Requests for reprints should be sent to Andrew Steptoe, DSc, DPhil, Department of Epidemiology and Public Health, University College London, 1-19 Torrington Pl, London, UK (e-mail: astepoe@ucl.ac.uk).

This article was accepted May 17, 2000.

usual health promotion methods, which mainly involved educating patients about the benefits of lifestyle change, encouraging them, and suggesting what changes could be made. Participants were reassessed at 4 and 12 months.

### Measures

Patients were classified on the basis of 1 of 5 stages for the 3 separate target behaviors (reducing dietary fat intake, stopping smoking, and increasing physical activity) by algorithms derived from previous studies,<sup>4,6,14</sup> as described elsewhere.<sup>15</sup> The 5 stages are *precontemplation* (patients are not eating a low-fat diet or currently exercising or are smokers, and they are not seriously considering changing behavior), *contemplation* (patients are considering a change in behavior but are not confident they will carry this out within the next month), *preparation* (patients are seriously planning to change behavior and are confident that they will make changes within the next month), *action* (patients have changed behavior within the last 6 months), and *maintenance* (patients have maintained the change for at least 6 months). The criterion for physical activity was exercising 3 or more times per week for at least 20 minutes on each occasion. There was no single criterion for dietary fat reduction, but patients were classified according to whether they were eating a self-defined low-fat diet. The stage measures were repeated at the 4- and 12-month assessments.

The smoking outcome measures were cotinine-verified abstinence at 4 and 12 months, together with reported number of cigarettes

smoked per day. Dietary fat intake was assessed by the Dietary Instrument for Nutritional Education, a validated food frequency questionnaire.<sup>16,17</sup> Physical activity was measured as number of episodes of activity in the last 4 weeks as defined by the UK National Fitness Survey.<sup>18</sup>

### Statistical Methods

Patients in the action and maintenance stages for each behavior were combined in the analysis, since the distinction between the 2 stages may be subject to recall bias. The analyses of changes from baseline to 4 and 12 months included all patients who participated in assessments at these times. The action/maintenance stage for smoking was defined as self-reported abstinence corroborated by cotinine measures. Action/maintenance for fat reduction was defined as following a self-reported low-fat diet; for physical activity it was defined as exercising vigorously or moderately for 20 minutes or more on at least 12 occasions in the past 4 weeks. Analyses, which were carried out on the complete sample for fat consumption and physical activity stages, were restricted to smokers at baseline for the analyses of smoking stages.

The relative efficacy of behavioral intervention and control counseling in achieving action/maintenance was analyzed by logistic regression. The relationship between baseline stage and change was analyzed with data pooled across groups by assessing the odds of attaining action/maintenance at 4 and 12 months for patients in the contemplation, preparation, or action/maintenance stages at baseline, compared with those in precontemplation. Finally, the odds

of action/maintenance at 4 months for patients in the behavioral intervention and control groups were analyzed separately by initial stage for dietary fat reduction and physical activity. Age and sex were included in the regression models; in the analyses, the confidence intervals were adjusted to allow for variability between practices.<sup>19</sup> Odds ratios adjusted for age, sex, and general practice are presented with 95% confidence intervals in Tables 1–4.

## Results

### Sample Characteristics

A total of 316 patients were recruited into the behavioral intervention and 567 into the control group. The characteristics of patients in the 2 groups are summarized in Table 1. They did not differ by sex distribution, age, or marital or educational status. Most (96.2%) of the participants were White, with a small proportion being Black (1.7%) or from the Indian subcontinent. At baseline, 45.8% of the subjects were smokers, 41.9% had cholesterol levels of 6.5 to 9.0 mmol/L, and 79.2% had a BMI of 25 to 35 kg/m<sup>2</sup> and insufficient physical activity. The proportions of patients with 1, 2, or 3 target risk factors were 43%, 48%, and 9%, respectively. The 2 groups did not differ by baseline dietary fat intake or regular physical activity, but smokers in the behavioral intervention group smoked more than did those in the control group.

Of behavioral intervention and control patients, 64.6% and 74.4%, respectively, completed 4-month assessments (9.9-percentage-point difference; 95% confidence interval [CI]=−1.3, 21.0) and 53.5% and 61.9% completed 12-month assessments (8.4-percentage-point difference; 95% CI=−4.7, 21.5). The distribution of stages of readiness to change behavior did not differ among the dropouts from the 2 groups.

### Stage of Change for Fat Reduction

The distribution of stages of readiness to reduce dietary fat is shown in Table 2. There was a substantial increase from baseline in the proportion of behavioral intervention patients in action/maintenance at 4 months (27.7-percentage-point increase) and 12 months (29.0-percentage-point increase). There was also an increase of the proportion of patients in the control group in action/maintenance, notably at 12 months (17.7-percentage-point increase). The proportion of precontemplators at 4 months decreased to a greater extent in the behavioral intervention group than in the control group. Among patients who were at an earlier stage at baseline, the odds (adjusted for

**TABLE 1—Characteristics of the Behavioral Intervention and Control Groups**

	Behavioral Intervention (n=316)	Control (n=567)
Sex, %		
Men	45.9	46.0
Women	54.1	54.0
Age, y (95% CI)	48.1 (44.8, 51.4)	46.0 (43.9, 48.0)
Marital status, %		
Married	79.3	75.2
Single	9.7	12.6
Divorced/widowed	11.0	12.2
Education, %		
No qualifications	27.4	29.8
CSE, GCSE, O level	36.6	39.9
A level, diploma	20.1	16.4
Degree	15.8	11.8
Cigarettes/day (95% CI)	19.5 (17.7, 21.2)	16.3 (15.0, 17.6)
Fat intake—DINE score (95% CI)	31.0 (29.2, 32.7)	28.3 (27.1, 29.5)
Physical activity <sup>a</sup> (95% CI)	6.59 (4.3, 8.9)	5.07 (3.5, 6.6)

Note. CI=confidence interval; DINE=Dietary Instrument for Nutritional Education; CSE=certificate of secondary education; GCSE=general certificate of secondary education; O level=ordinary level (the lowest level of British secondary school education); A level=advanced level (the highest level of British secondary school education).

<sup>a</sup>Number of sessions of moderate or vigorous activity of 20 minutes or more over the past 4 weeks.

**TABLE 2—Distribution (Percentages and 95% Confidence Intervals) of Stages of Change at Baseline and at 4 and 12 Months**

	Baseline		4 Months		12 Months	
	Intervention	Control	Intervention	Control	Intervention	Control
	<b>n=625</b>		<b>n=625</b>		<b>n=520</b>	
<b>Fat reduction</b>						
Precontemplation	21.6 (17.9, 26.0)	24.7 (19.6, 30.6)	9.9 (5.9, 16.0)	17.7 (14.4, 21.7)	14.1 (10.0, 19.6)	16.5 (12.8, 20.9)
Contemplation	9.6 (5.5, 16.3)	14.5 (9.5, 21.5)	8.9 (5.9, 13.3)	10.9 (7.2, 16.3)	5.7 (2.7, 11.6)	7.5 (5.6, 10.1)
Preparation	29.3 (26.6, 32.3)	19.3 (16.7, 23.1)	14.1 (9.4, 20.6)	17.7 (14.0, 22.2)	11.9 (9.0, 15.5)	16.8 (11.1, 24.4)
Action/maintenance	39.4 (32.7, 46.6)	41.5 (34.3, 49.0)	67.1 (56.7, 76.1)	53.6 (45.8, 61.3)	68.4 (61.1, 74.8)	59.2 (49.2, 68.6)
	<b>n=612</b>		<b>n=612</b>		<b>n=520</b>	
<b>Physical activity</b>						
Precontemplation	24.8 (19.4, 31.1)	39.7 (33.3, 46.4)	23.3 (16.0, 32.6)	33.4 (27.8, 39.5)	31.2 (24.8, 38.4)	33.0 (26.1, 40.1)
Contemplation	24.2 (18.8, 30.6)	18.6 (14.0, 24.3)	17.8 (13.8, 22.8)	17.3 (13.2, 22.4)	19.1 (11.2, 30.5)	18.0 (14.8, 21.7)
Preparation	40.4 (33.2, 48.1)	25.4 (21.4, 29.8)	26.7 (21.5, 32.8)	25.4 (21.4, 29.8)	19.1 (12.2, 28.6)	20.1 (16.1, 24.9)
Action/maintenance	10.6 (7.6, 14.6)	16.3 (12.6, 20.9)	32.2 (23.7, 42.0)	23.9 (17.8, 31.2)	30.6 (21.8, 41.2)	28.9 (24.0, 34.3)

age, sex, and general practice) of moving to the action/maintenance stage for the behavioral intervention group vs the control group were 2.15 (95% CI=1.30, 3.56) at 4 months and 1.26 (95% CI=0.73, 2.18) at 12 months.

*Stage of Change for Physical Activity*

At baseline, there were fewer patients in precontemplation and more patients in preparation in the behavioral intervention group than in the control group (Table 2). There was a marked increase in the proportion of patients in the behavioral intervention group in the action/maintenance stage after 4 months (21.6-percentage-point increase) and 12 months (20.0-percentage-point increase). A lesser increase was observed among patients in the control group. For patients who were in earlier stages at baseline, the odds at 4 months (adjusted for age, sex, and general practice) of moving to the action/maintenance stage for the behavioral intervention group vs the control group were 1.89 (95% CI=1.07, 3.36). The corresponding odds at 12 months were 1.68 (95% CI=1.08, 2.61).

*Stage of Change for Smoking*

At baseline, 39.3% of smokers were in the precontemplation stage, 45.4% were in the contemplation stage, and 15.3% were in the preparation stage. A minority moved to action/maintenance at 4 and 12 months, and the shifts between other stages were limited. The adjusted odds of action/maintenance for behavioral intervention vs control smokers were 1.77 (95% CI=0.76, 4.14) at 4 months and 1.49 (95% CI=0.56, 4.00) at 12 months.

*Baseline Stage and Achievement of Target Behavioral State*

Table 3 summarizes the odds of achieving the target behavioral stage as a function of baseline stage of readiness for each of the 3 behaviors, pooled between the behavioral intervention and control groups. There was an orderly increase in odds of achieving the target behavioral states across baseline stages. Except for fat reduction at 4 months, the odds by baseline stage were ordered as follows: action/maintenance > preparation > contempla-

tion > precontemplation. In the case of cigarette smoking, no patients were in the action/maintenance stage at baseline, since analyses were restricted to current smokers.

*Relative Efficacy of Behavioral Intervention at Different Baseline Stages*

The odds of achieving action/maintenance for patients in different stages at baseline are shown in Table 4. These analyses were restricted to reducing dietary fat and increasing physical activity, since the number of patients who stopped smoking was too small to compare stages in the 2 treatment groups. The results indicate that behavioral intervention for fat reduction was particularly effective for patients in the precontemplation and contemplation stages at baseline. The adjusted odds of achieving action/maintenance were 3.22 for patients in precontemplation and 2.83 for patients in contemplation. Behavioral intervention conferred little advantage over control conditions to patients in the preparation stage. A different pattern emerged for physical activity, since the relative efficacy of behavioral intervention

**TABLE 3—Adjusted Odds of Being in the Action/Maintenance Stage at 4 and 12 Months in Relation to Baseline Stage**

Behavior	Baseline Stage	4 Months		12 Months	
		Odds Ratio	95% CI	Odds Ratio	95% CI
Fat reduction	Precontemplation	1.00		1.00	
	Contemplation	0.75	0.34, 1.68	1.51	0.76, 3.00
	Preparation	2.03	1.36, 3.03	2.40	1.32, 4.36
	Action/maintenance	7.51	4.63, 12.2	6.20	4.18, 9.20
Physical activity	Precontemplation	1.00		1.00	
	Contemplation	1.87	1.07, 3.26	1.92	1.33, 2.80
	Preparation	3.01	1.84, 4.92	3.34	2.36, 4.72
	Action/maintenance	11.7	6.45, 21.1	9.67	6.56, 14.3
Smoking	Precontemplation	1.00		1.00	
	Contemplation	1.76	0.65, 4.78	1.20	0.37, 3.87
	Preparation	3.36	1.26, 8.96	1.34	0.45, 3.98

Note. CI=confidence interval.

**TABLE 4—Adjusted Odds of Action/Maintenance Stage at 4 and 12 Months for Behavioral Intervention vs Control, by Baseline Stage**

Behavior	Baseline Stage	4 Months		12 Months	
		Odds Ratio, Intervention vs Control	95% CI	Odds Ratio, Intervention vs Control	95% CI
Fat reduction	Precontemplation	3.22	1.42, 7.33	1.14	0.52, 2.48
	Contemplation	2.83	0.67, 11.8	0.87	0.23, 3.32
	Preparation	1.10	0.55, 2.16	1.29	0.56, 3.00
Physical activity	Precontemplation	1.28	0.51, 3.24	1.30	0.71, 2.38
	Contemplation	1.42	0.46, 4.38	1.00	0.49, 2.04
	Preparation	1.85	1.07, 3.18	1.89	1.03, 3.47

Note. CI = confidence interval.

was lower among patients in the precontemplation stage than among patients in the preparation stage.

## Discussion

General practices are appropriate settings for cardiovascular disease risk prevention because they are perceived as authoritative sources of health care and advice. However, the use of the stage of change model as a foundation for lifestyle intervention programs in general practice has been limited. One study involving short interventions of 3 to 5 minutes coupled with written information targeted dietary fat consumption,<sup>20</sup> as did a nonrandomized study of physical activity counseling by physicians.<sup>9</sup> A more extensive trial of physical activity counseling by general practitioners in Australia did not demonstrate any advantage of stage-based programs over routine care,<sup>8</sup> while a recent study of tailored physical activity counseling also showed no differences between intervention subjects and controls in activity levels at 6 weeks or 8 months.<sup>21</sup> None of these investigations focused on patients at increased risk for cardiovascular disease, but it can be argued that such patients may be more motivated to change and more likely to receive benefit from lifestyle intervention.

The Change of Heart Study demonstrated the benefits of relatively brief stage-based behavioral counseling for 2 of the 3 risk behaviors (dietary fat intake and regular physical activity).<sup>11</sup> The power of the study was insufficient to detect differences in smoking cessation, although the self-reported reduction in the number of cigarettes smoked was greater in the behavioral intervention group. The present results corroborate these differences in behavioral response by demonstrating that the likelihood of attaining the target stage of change in fat intake and physical activity was greater for the behavioral intervention group than for the control group at both 4 months and 12 months. A

similar pattern of forward progression through stages with stage-matched behavioral advice has previously been observed for reducing dietary fat,<sup>22</sup> increasing physical activity,<sup>23</sup> and stopping smoking.<sup>24</sup> However, it cannot be concluded that benefits are due to the use of stage-based interventions. Our intervention included a range of behavioral techniques that are also used outside the stage or transtheoretical model, such as goal setting, self-monitoring, reinforcement, and attitude change. The integration of stage-matched advice with broader behavioral modification principles is common to many studies of lifestyle counseling.<sup>10,25</sup> Proof of the specific benefits of adopting a stage framework therefore requires additional tests over and above the demonstration of greater behavior change than that achieved with routine care.

### The Value of Stage Classification

We assessed the value of the stage of change framework in 2 ways. First, we analyzed whether the likelihood of achieving behavioral targets would be associated with baseline stage. The results were consistent with prediction, since the odds of attaining action/maintenance increased progressively from precontemplation through contemplation and preparation for each behavior (Table 3).

The second test of the efficacy of stage-matched counseling was evaluating whether the behavioral intervention provided equal benefits over control conditions for patients in different stages at baseline. Since the behavioral counseling was tailored to the individual's initial stage of readiness, we hoped that procedures would confer similar advantages irrespective of the starting stage. The results of these analyses were equivocal. For fat reduction, behavioral counseling showed the greatest advantage over control conditions for patients in the precontemplation and contemplation stages at baseline (Table 4). By contrast, the

greatest benefit conferred by behavioral counseling for increasing physical activity was evident for patients in the preparation stage. Behavioral counseling for patients in the precontemplation stage focused on increasing awareness of the issues and changing attitudes, while the emphasis in the preparation stage was on the initiation of action through the identification of specific goals and skills. These different elements appear not to have been equally effective for encouraging fat reduction and increased physical activity.

### Study Limitations

There are a number of factors that affect the interpretation of these findings. The data are presented in terms of self-reported stages of change, and these may be subject to bias and error. However, associations (not reported here) between stage and behavioral measures of diet and physical activity were observed, and the changes in self-reported behavior were also correlated with changes in physical risk factors such as blood cholesterol and body weight.

The study was carried out in general practices in the United Kingdom, and results may not transfer to other settings. Patients were recruited from a wide range of communities, from the deprived to the moderately affluent. Results may not be comparable with those of investigations that have targeted affluent, well-educated sectors of the population.<sup>9,26,27</sup> Small numbers of ethnic minority patients were involved. Behavioral counseling was carried out by nurses after relatively brief training, and effects may have been smaller than those that could be achieved by more expert counselors.

Even though the 2 groups reported comparable levels of dietary fat intake and regular physical activity at baseline, there were differences in the distribution of stages. The higher proportion of behavioral intervention patients in the preparation stage for reducing dietary fat and increasing physical activity may have influenced the outcome of the trial. The goal for

physical activity was exercising at a moderate or vigorous level 3 times per week for at least 20 minutes, and this criterion has been superseded by more recent guidelines.<sup>28</sup> The number of smokers followed up was too small to permit detailed analysis of stage effects.

### Implications for Lifestyle Counseling

The results of this trial are broadly supportive of the stage-based framework for lifestyle change to reduce cardiovascular disease risk. The approach is readily comprehensible to health professionals who are not expert in behavior modification, and it is also appreciated by patients. However, it should be recognized that assessment of stages of readiness by self-report is prone to error. For example, misconceptions about fat consumption are common and can result in people classifying themselves as being in action or maintenance even when they have relatively high-fat diets.<sup>29</sup>

Individuals may consider themselves to be physically active despite failing to meet formal criteria. Baseline staging information should therefore be treated with caution. There is a danger that individuals who claim to be in the maintenance stage are not given sufficient attention, on the grounds that they are already achieving behavioral goals. Brief lifestyle counseling based on a stage-matched approach holds considerable potential for reducing vulnerability to cardiovascular disease among people in the community at raised risk. □

### Contributors

A. Steptoe and S. Hilton devised the original research question and developed the protocol with E. Rink. A. Steptoe and S. Kerry carried out the analyses. All of the authors contributed to writing the paper.

### Acknowledgments

This study was supported by the National Health Service R & D Programme in Cardiovascular Disease and Stroke.

The contributions of Sheelagh Doherty and Tony Kendrick are gratefully acknowledged.

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