

Does the effect of behavioral counseling on fruit and vegetable intake vary with stage of readiness to change?

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Abstract

Background. We have recently shown that brief behavioral counseling based on the stage of change (SOC) model stimulates greater increases in fruit and vegetable intake over 12 months than nutritional education in adults living in a low-income urban area. We tested the hypothesis that behavioral counseling would overcome the greater obstacles to change in precontemplators and contemplators compared with those initially in the preparation stage.

Method. Two hundred and seventy-one adults took part in a parallel group randomised controlled trial comparing behavioral counseling and nutritional education. Counseling was delivered in two 15-min sessions and accompanied by written material. Self-report changes in fruit and vegetable consumption over 12 months were analysed on an intention-to-treat basis and related to baseline stage of change.

Results. At baseline, 148 (54.6%) of participants were in preparation, 54 (19.9%) in contemplation and 69 (25.5%) in precontemplation. Preparers were younger, more educated and more likely to be female than were precontemplators and contemplators. In the nutritional education group, baseline stage predicted changes over 12 months, with larger increases in fruits and vegetables in the preparation than in the precontemplation or contemplation groups. This was not the case with behavioral counseling, in which increases in consumption were unrelated to baseline stage.

Conclusion. Tailored behavioral counseling helped to overcome the barriers to increasing fruit and vegetable intake present among participants in contemplation stage but not the precontemplation or preparation stages.

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Introduction

Diet is one of the main aspects of lifestyle influencing the risk of death from cancers and cardiovascular disease [1–3]. Despite public health campaigns promoting healthy changes to eating behaviour, such as the ‘5 A DAY’ programme in England [4] and ‘5 a Day For Better Health’ in the United States [5], fruit and vegetable intake has remained below recommended levels [6,7]. Knowledge concerning dietary recommendations remains low, particularly among people from poorer backgrounds and with less education [8]. Efforts to find ways to improve consumption of fruits and vegetables

remain vital in the struggle to reduce the incidence of chronic diseases and to redress inequalities in health.

This study was designed to test whether brief behavioral counseling led to greater increases in fruit and vegetable consumption than nutritional education among an ethnically mixed, inner city adult population from a deprived neighborhood. The behavioral counseling was based on social learning theory and the stage of change (SOC) model [9]. The principal results have been published elsewhere [10]. Over the 12-month period of the study, the number of portions of fruits and vegetables consumed by participants (analysed on an intention to treat basis) increased by 1.49 and 0.87 per day in the behavioral counseling and nutritional education conditions with a mean difference of 0.62 portions (confidence interval 0.09–1.13, $P = 0.021$). Poor knowledge of the recommended level of consumption and self-efficacy were related to intake [11]. The proportion of

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participants eating five or more portions a day rose by 42.4% and 26.8% in the two groups (mean difference 15.4%, confidence interval 2.52–28.3, $P = 0.019$).

In this article, we consider firstly whether the baseline stage of readiness predicted change over 12 months. The SOC model proposes that individuals vary in readiness to change so that healthy changes are likely to be greatest among people initially in the preparation stage, followed by those in contemplation, with the smallest changes from precontemplators. Such a pattern has previously been described for behaviours such as dietary fat reduction [12] and smoking [13] and is what we expected to find in the nutritional education group. Second, we investigated whether behavioral counseling had different effects depending on baseline stage. Behavioral counseling was tailored to focus on changing different attitudes and behaviours depending on initial stage of readiness to change, so it was hypothesised that the intervention would overcome the greater obstacles to change (such as cost, preparation time, taste and the belief that present level of consumption is adequate) in precontemplators and contemplators relative to participants initially in the preparation stage.

Method

Participants

The methodology and design of this study have been described elsewhere [10]. This study was a parallel group randomised controlled trial comparing a brief behavioral counseling intervention with nutritional education administered by nurses in a primary care centre in a low-income area. Two hundred and seventy-one participants were recruited by letter at random from the list of registered patients aged from 18 to 70 years from a single primary care centre located in a deprived ethnically mixed inner city area in South London. Information about the study was sent to 3,858 patients, and 775 (21%) patients replied. Of these, 459 (12%) expressed an interest but 188 were excluded. Exclusions included women who were pregnant or who planned to become pregnant within the next 12 months, people with a serious illness that would compromise their medium or long-term outlook (such as cancer, heart failure, renal failure, etc.) and those who self-rated their income as high. Only one person per household was recruited. A member of the research team who did not have contact with the participants individually randomised the sample of 166 women and 105 men into the behavioral counseling or the nutritional education condition. A minimisation procedure was used to ensure that the two groups were balanced in terms of gender and smoking. The behavioral counseling group consisted of 136 participants and 135 were randomised into the nutritional education group. All participants gave signed consent, and the study was approved by the Wandsworth Local Research Ethics Committee.

Measures

Fruit and vegetable intake was measured with a two-item frequency questionnaire [14]. Participants were asked how many pieces of fruits and how many portions of vegetables they ate on a typical day and were given detailed information about portion sizes. Potatoes were excluded and one portion of fruit juice was allowed. All other fresh, frozen, canned and dried fruits and vegetables were included. We validated this brief measure by documenting associations between reported intake and plasma ascorbic acid and β -carotene concentrations and urinary potassium excretion, as described in full elsewhere [15]. Stage of change was assessed using a questionnaire devised to measure participants' readiness to increase fruit and vegetable consumption at the start of the study, irrespective of whether they had made changes in the past; thus, by definition no participants were classified as being in the action or maintenance stages.

Participants were divided into three stages. Precontemplators were defined as those who were not currently thinking about increasing fruit and vegetables intake; contemplators were individuals who stated that they were thinking about increasing intake but were either not intending to do so within the next month, or were not confident of being able to stick to the plan; people in the preparation stage were thinking about increasing intake, were planning to do so within the next month and were confident of success. Additional measures not discussed here included blood pressure, height, weight, waist and hip circumference and attitudinal measures [10].

Intervention conditions

The goal of both interventions was to increase fruit and vegetable intake over a 12-month period from baseline levels. Counseling was carried out over two 15-min individual sessions, supported by written material. Participants in the nutritional education condition received information about the importance of increasing fruit and vegetable consumption, emphasising the '5 A DAY' message [16]. The beneficial biological effects of eating a healthy diet were described, and participants were advised about the range of fruit and vegetables available. These messages were reinforced at the second counseling session.

Nutritional information was also provided to the behavioral counseling group, but in addition the intervention was tailored to the individual, with personalised specific advice being given depending on stage of readiness to change. The behavioral counseling was designed to help participants anticipate and overcome barriers, increase confidence and self-efficacy and improve skills in acquiring and preparing fruits and vegetables.

The aim of counseling precontemplators was to make them aware that they were not eating enough fruits and vegetables, to explain the health benefits of eating more and to raise their motivation to change. Participants were given

the opportunity to ask questions, discuss concerns and asked to consider how they felt about increasing their intake. At the second counseling session, previous nutritional information was reinforced, further queries were discussed and participants were asked to set short- and long-term goals for fruit and vegetable consumption. They were also given individualised advice on how they might incorporate more fruit and vegetables into their daily diet.

The primary goal of counseling contemplators was to increase motivation and confidence in making a firm commitment to change. Participants were encouraged to think specifically about how they would increase their levels of intake daily in practice and what problems they might encounter. They were directed to anticipate times when it might be difficult to meet their goals and how they would solve this. In consultation with the counselor, they set themselves short- and long-term goals for consumption, which were reviewed and reinforced at the second session.

The counseling for participants in the preparation stage focused on helping them feel more confident of success, to make firm commitments that they would increase and sustain an increase in fruit and vegetable intake and to help them develop the practical skills to enable them to achieve these goals. They were encouraged to plan specifically how they might increase their intake, were given advice about purchasing and preparation and were asked to anticipate times when eating fruits and vegetables might be difficult and how they would overcome these challenges. They set achievable goals that they would be prepared to put into action immediately [17]. These plans were reviewed and developed further at the second counseling session.

The written material in the nutrition education condition provided further information to support the counseling, while the behavioral counseling group received extra advice about incorporating more fruits and vegetables into the diet and dealing with common obstacles. Two trained research nurses administered both behavioral counseling and nutritional counseling, and sessions were audiotaped and assessed to ensure that the two conditions remained distinct and to provide quality control.

Statistical methods

The characteristics of participants who were in precontemplation, contemplation and preparation stages at baseline were compared using analysis of variance and chi-squared tests as appropriate. Responses to the interventions were assessed by calculating changes in fruit and vegetable intake from baseline to 12 months, with positive values indicating an increase in consumption. These data were analysed on an intention to treat basis including all 271 participants. The number of participants who completed the 12-month follow-up was 218 (110 behavioral counseling and 108 nutritional education), and baseline values were brought forward for participants with missing data at 12 months. Analysis of covariance was used, controlling for variables previously

shown to relate to consumption, namely, age, income, sex, ethnicity and smoking status. Treatment group (behavioral, nutritional) and baseline stage (precontemplation, contemplation, preparation) were the between-subject factors, and adjusted change scores are presented. The main analysis was of fruits and vegetables combined, but separate analyses of fruit and vegetable intake were also carried out. Since we expected trends over stages of readiness to change in the nutritional education but not the behavioral counseling group, we carried out planned within-group analyses in addition to the group comparison.

Results

Baseline characteristics

The two treatment groups did not differ in terms of background demographic characteristics [10]. The mean age of participants was 43 years (range 19–73 years). The sample was ethnically mixed (71.2% White, 28.8% Black or Asian), and 67.8% were defined as low income (weekly income of less than £400). Fewer than half owned their own home and 35.1% were in receipt of welfare benefits. About one third were smokers and 31.3% took vitamin supplements. Within the behavioral counseling group, there were 54 men and 82 women. In the nutritional education group, there were 51 men and 84 women.

The characteristics of participants in the three stages of change at baseline are shown in Table 1. There was no difference at baseline in distribution of the stages of change between the two treatment groups. A larger number of participants fell into the preparation stage than the precontemplation or contemplation stages. Those in preparation were more likely to be women ($P = 0.002$), to be younger ($P < 0.001$) and have more education ($P = 0.026$) than those in the contemplation and precontemplation stages. Fewer of the ethnic minority than White participants were in the precontemplation stage at baseline ($P = 0.039$). There were no differences across baseline stage in marital status, income or body mass index. However, the number of portions of fruits and vegetables eaten differed across stages ($P = 0.012$). Participants in the precontemplation stage before the trial started were eating more fruits and vegetables than those in contemplation or preparation.

Change in fruit and vegetable intake

The change in the number of portions of fruits and vegetables over 12 months is shown in Fig. 1. No main effect of baseline stage on changes in fruit and vegetable consumption was observed. There was, however, a group \times baseline stage interaction ($P = 0.015$). Analyses were carried out of the groups separately to explore the source of this interaction. There was no effect of initial stage in the behavioral counseling group ($P = 0.28$), so similar increases

Table 1
Characteristics of participants in the three stages of readiness to eat more fruits and vegetables at baseline

	Precontemplation (n = 69)	Contemplation (n = 54)	Preparation (n = 148)	Significance (P value)
Behavioral counseling	38 (55.1%)	25 (46.3%)	73 (49.3%)	0.51
Nutrition education	31 (44.9%)	29 (53.7%)	75 (50.7%)	
Gender				
Men	34 (49.3%)	27 (50.0%)	44 (29.7%)	0.002
Women	35 (50.7%)	27 (50.0%)	104 (70.3%)	
Age (years)	47.7 (13.4)	45.3 (13.0)	40.4 (13.9)	0.001
Education				
Less than high school	31 (51.7%)	22 (43.1%)	49 (35.0%)	0.026
High school or more	29 (48.3%)	29 (56.9%)	91 (65.0%)	
Ethnic group				
White	55 (82.1%)	36 (67.9%)	99 (67.3%)	0.039
Black or Asian	12 (17.9%)	17 (32.1%)	48 (32.7%)	
Marital status				
Married	36 (52.2%)	17 (31.5%)	55 (37.2%)	0.068
Other	33 (47.8%)	37 (68.5%)	93 (62.8%)	
Body mass index (SD)	25.3 (4.4)	25.9 (5.1)	25.8 (5.4)	0.67
Weekly household income				
<£400 pw	37 (58.7%)	38 (70.4%)	102 (70.8%)	0.11
>£400 pw	26 (41.3%)	16 (29.6%)	42 (29.2%)	
Current smokers	21 (30.4%)	19 (35.2%)	51 (34.5)	0.60
Taking vitamin supplements	20 (33.3%)	16 (31.4%)	42 (30.4%)	0.69
Baseline fruit and vegetable intake (portions per day)	4.22 (2.05)	3.39 (2.24)	3.46 (1.64)	0.012

Number (percentage) and means (SD).

in consumption occurred across all stages. But in the nutritional education group, baseline stage predicted changes over 12 months ($P = 0.033$), with a greater increase in consumption being achieved by participants initially in the preparation compared with the precontemplation and contemplation stages. As can be seen in Fig. 1, the superior effect of behavioral counseling was most apparent in contemplation stage (adjusted difference in intake between groups of 1.67 portions), while there was no difference between groups in the increase in fruits and vegetables of participants in preparation at baseline.

The analysis of changes in fruit intake paralleled the results for fruits and vegetables combined, with a group \times baseline stage interaction ($P = 0.032$) and no main effect of baseline stage. As can be seen in Table 2, adjusted differ-

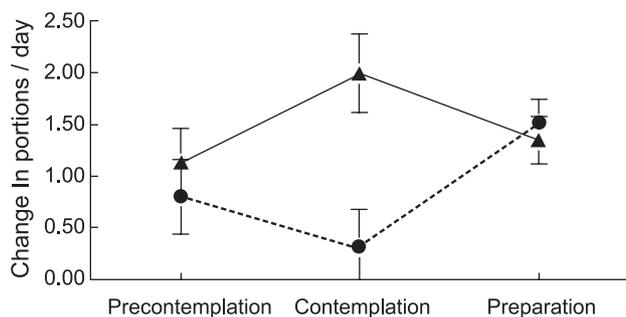


Fig. 1. Mean increases in consumption of portions of fruits and vegetables per day over 12 months in the behavioral counseling group (solid line) and the nutritional education group (dashed line), categorised according to baseline stage of readiness to change. Data adjusted for gender, age, ethnicity, income and smoking status.

ences between groups were greatest for participants in the contemplation stage at baseline. In the analysis of changes in vegetable intake, there was a main effect of baseline stage ($P = 0.035$), but no group \times stage interaction (Table 2). The increase in reported vegetable intake was least in the precontemplation stage (mean 0.13, SD 1.6), greater on average in the contemplation stage (mean 0.35, SD 1.2) and greatest in the preparation stage (mean 0.63, SD 1.0).

Discussion

The results of this analysis indicate that increases in fruit and vegetable consumption over 12 months were systematically associated with stage of readiness to change assessed before the intervention, but only in the nutrition education group. The greatest increases were reported by participants in the preparation stage, and the smallest changes from

Table 2
Changes in fruit and vegetable consumption over 12 months analysed separately in relation to group and baseline stage of readiness to change

	Precontemplation	Contemplation	Preparation
Change in fruit intake			
Behavioral counseling	0.99 \pm 1.3	1.21 \pm 1.2	0.72 \pm 1.2
Nutrition education	0.67 \pm 1.2	0.38 \pm 1.1	0.90 \pm 1.2
Change in vegetable intake			
Behavioral counseling	0.14 \pm 2.0	0.77 \pm 0.8	0.63 \pm 0.8
Nutrition education	0.13 \pm 1.0	-0.07 \pm 1.3	0.62 \pm 1.2

Increases from baseline to 12 months adjusted for gender, age, ethnicity, income and smoking status.

people initially in contemplation (Fig. 1). This pattern was not replicated in the behavioral counseling group, where changes were unrelated to baseline stage. Our interpretation of this pattern is that behavioral counseling was successful in overcoming the greater reluctance to change among people initially in contemplation and to a lesser extent in precontemplation, compared with those in the preparation stage.

There were differences in the characteristics of people categorised as being in precontemplation, contemplation or preparation (Table 1). Participants in preparation were more likely to be female, younger and better educated than those in precontemplation and contemplation. Male gender, advancing age and lower education have been found in other studies to predict a lack of healthful dietary change [18] and an increased likelihood of falling into the precontemplation stage [19]. Women are often responsible for buying and preparing food in households and may therefore be more frequently exposed to nutritional education via the media [19,20]. They may also be more interested in weight control and issues related to body image and hence more motivated to provide a healthy diet for themselves and their family.

Interestingly, Black and Asian participants were more likely to fall into the preparation stage. It seems to be more difficult to recruit people from ethnic minority backgrounds for research studies, possibly due to language or cultural barriers or a mistrust of medical research [21]. It is likely therefore that the ethnic minority men and women who volunteered for this study had a special interest in dietary issues and thus tended to fall into the preparation stage. Dietary acculturation, the process whereby immigrant populations adopt the dietary practices of the host country [22], may also have played a role. People raised in a culinary tradition where fruits and vegetables are relatively cheap and accessible, and where the traditional diets include fruit, vegetables and pulses, may have been more ready to make the changes encouraged in this study.

Participants ate an average of 3.64 portions per day at baseline. This is comparable with the mean of 3.85 portions per day measured across all households in 1999 by the National Food Survey in UK [23], with averages of 3.31 and 3.28 portions in low and very low income households. However, baseline participants in precontemplation stage ate an average of 4.22 portions of fruits and vegetables per day, more than either of the other two stages (3.39 and 3.46 portions, respectively). The reason for this is not clear, but it may relate to the way in which stage of change was defined. We classified people on the basis of their readiness to change at the beginning of the study, without reference to their previous dietary history. Hence, no individuals were defined as being in action or maintenance stages. It is possible that some precontemplators had made changes to their diet before the study and were under the impression that they were already eating enough fruits and vegetables and did not consider it necessary to make further increases. If this was true, then the behavioral

counseling may have helped to overcome this particular barrier in some precontemplators.

A larger proportion of participants in this study fell into preparation stage than into the other two stages. This is likely to be due to the way in which participants were categorised (as mentioned previously) and is also common to other studies. Brug et al. [24] reported more participants in preparation stage than the two earlier stages in a study investigating consumption of fruits and vegetables and psychosocial factors. Delichatsios et al. [25] also found more participants fell into preparation stage at baseline than the other four stages in the EatSmart study, which evaluated a nutrition intervention to improve dietary habits among 504 primary care participants.

The principal hypotheses addressed in these analyses were confirmed for fruits and vegetables combined and for fruit alone. In both cases, baseline stage of change predicted the magnitude of increased intake in the nutrition education but not the behavioral counseling condition. The nutritional education was intended to be a control procedure but nevertheless appeared to have had a positive effect, particularly for people initially in preparation. The average increase of 0.87 portions per day compares favorably with the mean increase of 0.6 portions per day reported in a recent review of behavioral dietary interventions [26]. This study did not include a no contact control condition, so it is not certain how much of the change in the nutrition education group was due to secular trends. The increased intake was, however, corroborated by increases in plasma α -tocopherol and β -carotene and therefore was not due to self-report bias [10,15]. The findings suggest that presenting nutrition information in a brief individual face-to-face session with a health professional may promote marked increases in consumption that endure for at least 12 months. Other studies have also shown that nutritional information can produce significant effects [27].

The tailored advice provided to the behavioral counseling group was evidently successful in overcoming the greater barriers to change reported by people in contemplation and to a lesser extent in precontemplation. It was not effective, however, in promoting further increases in intake from individuals in the preparation stage, over and above the changes achieved with nutritional counseling (Fig. 1). There are several possible reasons for this result. One is that individuals in preparation are well motivated for change, so only required the nonspecific stimulus of personal encouragement and participation in a research trial to modify their diets. Alternatively, the behavioral counseling given to preparers may have been less efficacious. Although material was tailored to stage, with an emphasis on the initiation of action and identifying specific goals and skills in the preparation stage, the behavioral counseling may have been more useful in overcoming the attitudinal barriers to eating fruits and vegetables emphasised in the earlier stages of change.

This study has a number of limitations. The representativeness of the sample may have been affected by including

participants who lived in a deprived inner city area, and different factors may be important in rural populations. Only 12% responded to the invitation to participate, and we had no information about the dietary habits or income of non-participants. It is possible that some people did not respond to the invitation to participate because they realised they were ineligible due to a higher income status or were discouraged by the requirements for blood and urine samples. Average fruit and vegetable intake in this study was 3.64 portions per day, which is comparable to the mean intake of 3.85 in the 1999 national food survey [23], suggesting that participants were not unusual in their dietary intake. Since half of participants were in the precontemplation or contemplation stages, the study was not restricted to people actively considering dietary change. Fruit and vegetable intake was based on self-report and may therefore be subject to bias. Changes in consumption in this study were, however, associated with alterations in biomarkers (not reported here) such as plasma levels of α -tocopherol, β -carotene and urinary potassium excretion [10]. Participants volunteered to take part in a dietary intervention study, which may have reflected a particular interest in health and nutrition, and may therefore have had greater motivation to change than would be present in the general population.

The incidence of coronary heart disease and many cancers is known to be inversely related to socioeconomic status and poor neighborhood of residence [28,29]. Unhealthy diets are particularly common in these sectors of society. The UK National Diet and Nutrition Survey recently reported that during a 7-day measurement period, 35% of men and 30% of women living in poor households had eaten no fruit [6]. Methods of improving diets of low-income populations are important because they may contribute to a reduction in social disparities in major chronic diseases. Community-based health centers are appropriate locations for such programs as they are perceived as authoritative sources of advice and health care and accessible to a wide spectrum of the population.

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