

Short Communication

Bowel health to better health: a minimal contact lifestyle intervention for people at increased risk of colorectal cancer

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Colorectal cancer screening forms part of Scotland's cancer reduction strategy. Screened participants, who had undergone colonoscopy and had adenoma(s) removed, were invited to participate in the bowel health to better health (BHBH) programme. BHBH tested the hypothesis that a minimal contact lifestyle intervention could prove effective in promoting changes in diet and activity. Baseline and follow-up questionnaires on lifestyle and psycho-social measures were undertaken in adults randomised to BHBH or a comparison group (CG). The 3-month intervention comprised personalised lifestyle advice, goal-setting and social support to promote increases in physical activity, fibre, fruit and vegetables. Response rate to BHBH was 51%. BHBH participants (n 32) increased their intake of fibre (DINE FFQ scores 30 (SD 11)–41 (SD 13)) significantly ($P < 0.001$) more than the CG (n 30; 31 (SD 8)–30 (SD 11)). No significant differences between the groups were detected for changes in fruits, vegetables and moderate activity. At baseline, only one participant from each study arm, met the target recommendations for fibre, fruit and vegetable intakes and physical activity. At follow up a significant number of BHBH participants, 15 (47%) compared to 4 (13%) of the CG were achieving all three lifestyle recommendations (χ^2 (1, n 62) = 8.196, $P = 0.006$). If sustained, the positive behaviour change achieved through this intervention has the potential to impact on the progression of chronic disease risk including CVD.

Randomised controlled trials: Lifestyle intervention: Colorectal adenoma

Colorectal cancer is a leading cause of illness and death in the Western world with Scotland having one of the highest incidences (41.1 per 100 000) in Europe⁽¹⁾. Colorectal cancer screening programmes were initiated in the UK in 2000⁽²⁾ using faecal occult blood testing (FOBT) that detects cancer and adenomas (which can then be removed at colonoscopy). However, while endoscopic polypectomy removes adenomas and reduces the risk of disease, the underlying factors that influence the development of further adenomas, cancers and other chronic diet-related diseases remain.

Evidence suggests that behaviour change programmes that target high-risk groups may be more effective than those targeting the population at large⁽³⁾. In addition, it is likely that individuals who have had a recent health scare may be more motivated towards lifestyle change. By targeting a screened population, it may be possible to benefit from raised perceptions of personal risk that, while operating at the individual level, can also promote the behaviours sought by population approaches.

It is acknowledged that colorectal cancer risk may be modified by diet, foods, nutrients, alcohol and physical activity⁽⁴⁾; but there are no lifestyle intervention programmes routinely

available for individuals considered at increased risk. Leaflets focusing on general dietary advice may be provided, but these have not been shown to be effective in changing behaviour⁽⁵⁾. At a time when national policy supports cancer reduction, the absence of targeted lifestyle programmes for this population group remains a missed opportunity.

Over half of the invited population aged 50–69 years has participated in the population-based colorectal cancer screening programme⁽⁶⁾, and it is possible that these adults may be more motivated (towards preventive behaviours) than the population at large. The basis for the present research was that screened participants with elevated risk may be amenable to receiving and acting on lifestyle advice.

Formative research was undertaken to assess eating habits and the magnitude of change necessary among the target population⁽⁷⁾. Intake of dietary fibre (NSP), fruit and vegetables was low in relation to cancer prevention guidelines. Similarly, levels of reported physical activity from these participants also demonstrated inadequate levels of moderate activity. These three areas (fibre, fruit and vegetable intakes and physical activity) provide an opportunity to focus on a positive behaviour change (e.g. 'do more') approach to intervention

Abbreviations: BHBH, bowel health to better health; CG, comparison group; FOBT, faecal occult blood testing.

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within the framework of cancer prevention⁽⁸⁾. The formative research also informed the background and design of the intervention content. The primary aim of the intervention was to increase dietary fibre and secondary aims were to increase fruit and vegetable intake and physical activity.

Methods

The impact of the bowel health to better health (BHBH) programme was tested in a control and intervention, pre- and post-repeated measures trial among adults participating in the Scottish colorectal screening pilot study, who had adenoma(s) removed during colonoscopy. The revised template of the consolidated standards of reporting trials⁽⁹⁾ was followed where possible. Participants in the intervention group received the BHBH programme, and the comparison group (CG) participants only completed assessments. Measures of dietary behaviour, physical activity and psycho-social measures (validated questionnaires on attitudes, subjective norm and self-efficacy) were assessed at baseline and follow-up, and were the same for all participants.

Participants were recruited from Tayside residents who had taken part in colorectal screening. Individuals, who had been invited to attend for colonoscopy (following a positive FOBT), were approached to participate in the BHBH study, providing the following inclusion criterion could be met:

- (1) Initial colonoscopy showing at least one adenoma.
- (2) Ability to provide informed consent to participate in the programme.

Exclusions comprised:

- (1) Invasive colorectal carcinoma.
- (2) Metaplastic or hyperplastic non-adenomatous polyps.
- (3) Normal or clear colonoscopy.

The present study was conducted according to the guidelines laid down in the Declaration of Helsinki, and all procedures involving human subjects/patients were approved by the Tayside Medical Research Ethics Committee. Written informed consent was obtained from all participants.

Intervention

Participants were randomly assigned (stratified for age, sex, social index of multiple deprivation and time to follow-up) to the BHBH or a CG using a minimisation programme⁽¹⁰⁾.

The 12-week intervention consisted of a minimal contact programme comprising one personal contact between a researcher and the participant at baseline (week 0). This visit lasted approximately 2 h where assessments were made, general cancer prevention literature was given (with the details on diet and activity verbally communicated and questions answered), the personalised programme was explained and social support was identified. This interaction was enhanced by three personalised mailings at weeks 1–2, 5–6 and 9–10, which were sent with a motivational letter and specific guidance. The guidance covered practical routes to achieving increased physical activity (30 min moderate activity on most days with a primary focus on walking, but other activities were all recommended on a personal basis and individual ability), increased fruit and vegetable intakes (moving towards

at least five per day) and increased cereal fibre intake (daily consumption of whole-grain bread, cereals and pulses), respectively. Each mailing comprised personalised goals tailored to the individual according to baseline assessments of outcome measures (e.g. present consumption and activity levels) and self-efficacy for behaviour change. Fig. 1 provides details of educational, behavioural and psycho-social aspects of the programme.

Sample size and recruitment

Sample size calculations were based on the primary aim of increasing dietary fibre and derived from data obtained in the formative research, which reported a mean daily fibre intake of 14 (SD 4) g⁽⁷⁾. To demonstrate an increase to the present recommended 18 g per day, a total of sixty-four participants (thirty-two in each condition) would provide 95% power at $P < 0.05$.

Measures

Age, smoking status, post-code, ethnicity, sex and household composition were recorded for all participants at baseline. Height and weight were measured.

Participants in both groups completed a 24 hour recall of fruits and vegetables (recorded on a midweek day) and a FFQ (DINE). The validated DINE⁽¹¹⁾, self-report questionnaire provided a fibre score that identified low-, moderate- or high-fibre intakes where a fibre score of < 30 is low fibre (equivalent to < 20 g per day), 30–40 is moderate fibre (equivalent to 21–30 g per day) and 40 $>$ is high fibre (equivalent to > 30 g per day). The instrument contained separate items on whole-grain bread, crispbreads, breakfast cereal, fruit, vegetables, peas, beans, potatoes and pasta/rice. Thus, increasing intakes of bread, crispbreads, potatoes and pasta would create a higher score than simple increases in fruit.

Physical activity was assessed using a 7-d physical activity recall (Scottish physical activity questionnaire-2) validated with a Scottish population⁽¹²⁾. In addition, all participants completed a range of psycho-social assessments (reported elsewhere).

Data analysis

Analysis was carried out using SPSS for Windows Release 14.0.0 (2005; SPSS Inc., St Louis, MO, USA). For the primary outcome measures, independent t tests and CI were calculated (or the difference between means) to carry out a significance test of the null hypotheses that the difference between the means is zero ($P < 0.05$).

Results

Response rate to BHBH was 51% and sixty-two out of seventy-four completed the study (84% retention rate). Table 1 illustrates that 71% of eligible participants were males. Males and females participated in the BHBH study at the same rate with 51% of females and 50% of males agreeing to participate. There were no significant differences in baseline demographics between the groups. It is, however, noted that 81% ($n = 57$) of participants at baseline were in the

	Personal contact	Mail 1*	Mail 2*	Mail 3*
Time plan	(week 0)	(weeks 1–2)	(weeks 5–6)	(weeks 9–10)
Focus	Baseline assessments and consultation	Physical activity (PA)	Increasing fibre with fruits and vegetables	Increasing fibres with cereals, pulses and whole grains (DF)
Aims	To familiarise participants with study timetable and content. Also to enlist social support and explain role.	Minimum increase in at least 30 mins/week (towards achieving present target for moderate exercise of 30 mins on most days of the week).	Increase DF by moving towards or exceed present target of five portions of fruit and vegetables per day.	To increase dietary intake to the recommended 18 g/day or for those already at target, maintain or aim higher
Content				
Behaviour theory	Self-efficacy explained	Self-efficacy, implementation intentions	Self-efficacy, implementation intentions	Self-efficacy, implementation intentions
Educational approaches	General cancer prevention literature	PA literature	F and V literature including recipes	DF literature (including recipes)
Psycho-social aspects				
Social support	Friend/partner encouraged to be present at interview. Role explained. Telephone support offered.	Encourage supporting friend/partner to share literature and set personal action plans. Motivational letter. Personalised feedback on present habits encouraging small change based on discussion at visit.	Encourage supporting friend/partner to share literature and set personal action plans. Motivational letter. Personalised feedback on present habits encouraging small change based on discussion at visit.	Encourage supporting friend/partner to share literature and set personal action plans. Motivational letter. Personalised feedback on present habits encouraging small change based on discussion at visit.
Personalisation				
Motivational and behavioural approaches	Personal action plans explained. Benefits of keeping records discussed	Setting personal action plan keeping PA record	Setting personal action plan keeping F and V record	Setting personal action plan keeping DF record

* Delivery of mailings 1, 2 and 3 is dependent upon results of baseline assessment; beginning with the area the participant is strongest in.

Fig. 1. Bowel health to better health.

Study characteristics

Bowel health to better health

Table 1. Socio-demographic characteristics of participants (Mean values and standard deviations)

Demographic	BHBH		CG	
	Mean	SD	Mean	SD
Sex				
Males	28		24	
Females	13		9	
Age (years)	61.5	5.9	63.5	4.9
Ethnicity				
Caucasian	41		33	
Marital status				
Married	34		24	
Cohabiting	2		2	
Single	5		7	
Deprivation categories (SIMD)				
Low (I–III)	8		6	
Medium (IV–VII)	16		12	
High (VIII–X)	17		15	
Smoking status				
Smokers	5		3	
Ex-smokers	21		17	
Never smoked	15		13	
Height (m)	1.68	0.08	1.7	0.09
Weight (kg)	84.1	19.4	84.1	14.6
BMI (kg/m ²)	29.5	5.1	29.2	5.0

BHBH, bowel health to better health; CG, comparison group; SIMD, social index of multiple deprivation.

overweight category and the mean BMI (29.4 (SD 5) kg/m²) for all participants was bordering on the obese category.

Participants in the BHBH arm of the study made significantly greater increases in dietary fibre intake than the CG (Table 2). The increase in fibre intake reported among BHBH participants saw the mean intake rise from a low- to high-fibre rating. At baseline, only 6% (*n* 2) of BHBH participants had been rated as high-fibre consumers and this increased to 53% (*n* 17) at follow-up. At baseline, 53% (*n* 17) of BHBH participants were rated as low-fibre consumers and this dropped to 16% (*n* 5) at follow-up. The CG also increased the proportion of high-fibre consumers (from 10% (*n* 3) to 20% (*n* 6)), but this was also accompanied by an increase in low-fibre consumers up from 43% (*n* 13) at baseline to 63% (*n* 19) at follow-up.

No significant changes were detected in the self-reported increase in fruit and vegetable intakes in either the BHBH

or CG participants (from 4.8 to 7.9 and 4.8 to 7.3 portions per day, respectively), or between group increases in fruit and vegetable consumption at follow-up (0.6 portions per day in the BHBH group over the CG) or in the proportion of participants meeting the ‘5-a-day’ recommendation (rose from 44% (*n* 14) at baseline to 84% (*n* 27) at follow-up, compared with a rise from 50% (*n* 15) to 67% (*n* 20) for those in the CG).

Physical activity increased in both groups, but although participants in the BHBH arm of the study demonstrated an encouraging intervention effect of 24 min per day of moderate activity over the CG, this did not reach significance (95% CI (−9, +56), *P*=0.152). No significant differences between the groups were detected for self-reported changes in body weight during the study period, BHBH 82.2 (SD 15.2) kg at baseline and 81.1 (SD 15.0) kg at follow-up (difference −1.1 kg) and CG 83.9 (SD 14.4) kg at baseline and 83.9 (SD 14.9) kg at follow-up (no change).

At baseline, only one participant from each study arm, met the target recommendations for fibre, fruit and vegetable intakes and physical activity. At follow up a significant number of BHBH participants, 15 (47%) compared to 4 (13%) of the CG were achieving all three lifestyle recommendations (χ^2 (1, *n* 62) = 8.196, *P*=0.006).

Discussion

As a feasibility study, the findings on the recruitment procedures, response rate, retention and delivery of intervention indicate that this arena is a plausible setting for lifestyle intervention. The response rate for BHBH at 51% was disappointing, but it is likely that this dropped from the initial 68% after a competing adenoma study began recruiting from the same participants. The retention rate (81%) of the study suggests that interest to participate did translate into motivation to attempt behaviour change over the 12-week study. Analysis of deprivation data, age and sex showed no differences between participants and non-participants. While fewer people from areas of high deprivation participate in screening programmes, those that did participate in the colorectal screening were equally likely to participate in BHBH too.

Table 2. Primary outcome measures for participants at baseline and follow-up (Mean values and standard deviations)

	Baseline		Follow-up		Difference in mean value (follow-up – baseline)	Intervention effect		
	Mean	SD	Mean	SD		Mean difference	SE	Significance
Fibre score								
BHBH	30	11	41	13	11	+13	3	0.000
CG	31	8	30	11	−1			
Fruit and vegetables (portions/d)								
BHBH	4.8	2.5	7.9	3.1	3.1	+0.6	0.8	0.423
CG	4.8	3.1	7.3	4.2	2.5			
Physical activity (min/d)								
BHBH	50	49	85	72	35	+24	16	0.152
CG	68	74	79	70	11			

BHBH, bowel health to better health (*n* 32); CG, comparison group (*n* 30).

Participation in the BHBH lifestyle intervention demonstrated significant increases in dietary fibre intake. The mean DINE fibre score of 41 at follow-up equates to high-fibre intakes (over 30 g per day based on the DINE validation), which is an encouraging move in the direction towards the mean intake of 35 g fibre per day, which has been associated with risk reduction for colorectal cancer. In fact, observational data from the EPIC study⁽¹³⁾ suggest that in populations with low average intake of dietary fibre, an approximate doubling of total fibre intake from foods could reduce the risk of colorectal cancer by 40%.

The change in reported fruit and vegetable intakes was encouraging and similar to the effect recorded in other fruit and vegetable studies⁽¹⁴⁾. Future work could usefully include a biomarker for validation of reported increases in consumption. It is highly likely that the lack of difference in fruit and vegetable changes between the groups, but greater increased overall fibre score relates to the focus of the BHBH intervention on all fibre sources, notably pulses and cereal.

This is the first study to demonstrate that this population group is responsive to a minimal contact intervention programme framed within a cancer reduction service, and indicates a potential cost-effective approach for engaging with adults at a time when chronic diseases are present. While the evidence for lifestyle change in the Scottish population at large is poor, this programme has demonstrated that the present approach offers an effective personal prompt to initiate behaviour change. Evidence from other screening programmes⁽¹⁵⁾ suggests that it is likely that anxiety levels will be high at the time of a positive test and at investigation. The present study was not designed to measure the impact of the intervention on long-term lifestyle change, which would require long-term follow-up to be undertaken.

The results of the exploratory work did not support the hypothesis of self-motivated behaviour change. Indeed, lack of awareness regarding the link between diet and colorectal cancer, particularly among Scottish men⁽¹⁶⁾, has been previously reported. There is no existing evidence for meaningful lifestyle change following diagnosis of adenoma⁽¹⁷⁾. It is unclear in the present study whether reported increases in fruit and vegetable intakes and physical activity between baseline and follow-up among CG participants were due to self-motivated behaviour change as a result of raised anxiety due to a positive FOBT or a Hawthorn effect (i.e. participation effect). It is not possible to rule out the possibility that the high self-reported fruit and vegetable intakes at follow-up could be attributed to the positive FOBT alone. Had a third group of healthy, age-matched volunteers with a negative FOBT been included this hypothesis could also have been tested.

The recent publication of the World Cancer Research Fund⁽¹⁸⁾ is an update of the evidence for colorectal cancer disease risk reported in 1997⁽⁴⁾ and is a timely reminder of the strengthening evidence base. Such findings should be considered in future dietary and lifestyle interventions, especially weight reduction. The mean BMI of the BHBH participants (29.4 (SD 5.0) kg/m²) was bordering on the obese category and highlights the incidence of excess weight in this population.

The insights gained from this investigation provide a culturally relevant platform on which to inform future studies.

The present work focused on promoting change and not long-term behaviours. Future work would benefit from examining the long-term follow-up from this intervention, and whether the impact of a health scare diminishes with time or becomes more important as the symptoms of chronic diseases start to emerge with increasing age.

Through colorectal cancer screening, adenoma detection rates are set to increase. A lifestyle intervention programme delivered with screening may have significant impact on the progression of further chronic disease risk and the associated costs (both financial and personal).

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