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ORIGINAL ARTICLE

Living Well with Lifestyle Medicine: A group consultation approach to delivering Lifestyle Medicine Intervention in Primary Care

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Abstract

Introduction: Increasing prevalence of chronic disease is raising demands on the healthcare system, and evidence-based cost-effective ways to address these are needed. This project piloted a novel approach of delivering lifestyle medicine in general practice by providing a holistic lifestyle medicine programme to patients at high risk of chronic diseases.

Methods: Eleven patients at high risk of chronic disease participated in a 6-week programme of General Practitioner (GP)-led group consultations, which delivered evidence-based lifestyle education and interventions across all the pillars of lifestyle medicine. Anthropometric data (including weight and body mass index (BMI)) and quality-of-life data (using the EuroQol-5D (EQ-5D-5L) tool) and patient's confidence and motivation were assessed at the beginning and end of the programme to assess impact. Cost-effectiveness was estimated by calculating the cost-per-quality-adjusted-life-year (QALY) for the EQ-5D-5L data.

Results: Seventy-three per cent of participants lost weight, with an average weight loss of 1.7 kg confidence interval (CI), −3.46 to −0.02 kg; $P = 0.048$), which resulted in an average BMI reduction of 0.56 (CI, −1.11 to −0.02; $P = 0.043$) over 6 weeks. Quality of Life scores show improvement, with EuroQol-visual analogue scale (EQ-VAS) score increase of 23 points (CI, +11.82 to +34.18; $P = 0.002$) and EQ-5D-5L scores show reduction in mobility problems, anxiety and depression and pain. Patient's self-rated confidence and motivation to make healthy lifestyle changes improved significantly over the programme.

Conclusions: Delivery of lifestyle medicine intervention via a GP-led group consultation model results in improvement in patients' perceived health and well-being, along with reductions in weight, and reduced problems with mood and pain. Delivery of care in this way is cost-effective. The positive findings from this pilot-scale study support investment in a larger study to further develop and explore delivery of lifestyle medicine intervention in this way.

KEYWORDS
general practice, life style, shared medical appointments

1 | INTRODUCTION

Chronic diseases are increasing; the WHO described non-communicable diseases as the biggest preventable cause of morbidity and mortality.[1] Multiple unhealthy behaviours have a cumulative effect on ill-health; someone in mid-life who smokes, drinks alcohol above the recommended levels, is physically inactive and has a poor diet is four times as likely to die over the next 10 years than someone who has a healthier lifestyle.[2]

Lifestyle medicine uses evidence-based lifestyle therapeutic approaches to prevent, treat and reverse disease. The lifestyle medicine approach includes a whole-food, plant-based diet; regular physical activity; adequate sleep; stress management; avoidance of risky substances and use of non-drug modalities to promote health.[3]

Most lifestyle interventions studied look at the effects of a single variable on the desired outcome. It has been shown that improvement in just one aspect of lifestyle has a significant improvement on morbidity and mortality, regardless of which aspect of health behaviour is improved. The same study showed that improving just one aspect of health behaviour had significant cost benefit and was cost-effective for the health economy.[4]

However, the reality is much more complex; in any one individual, multiple lifestyle factors interact interdependently to influence the overall health outcome. Thus, trying to correct any one particular factor may be confounded by the effects of others. For instance, patients will often complain that they cannot lose weight despite regular exercise, even above and beyond the recommended levels; in this scenario, it is often the case that other compounding factors are at play such as stress, poor diet, lack of sleep or psychological factors.

Moreover, for many, there are quite significant changes that need to be made to multiple areas of lifestyle. By trying to get any one aspect of lifestyle 'right' before addressing others, it is setting a high, possibly unmanageable, target. It is more realistic to set 'smart' goals in multiple areas making several small, manageable, realistic targets across a broad base, rather than one single big goal. Instead of prescriptive or didactic advice, patients can be presented with a range of multiple evidence-based lifestyle changes to choose from to suit their needs. This empowers patients to make an individualized 'lifestyle action plan' as increased patient autonomy has been shown to lead to improved health.[5] Initial changes will lead to some measurable improvements, which may then inspire onwards continuation of positive change to build on their initial successes.

A great deal of time would be required to discuss the wide number of topics encompassed by all the pillars of a Lifestyle medicine, especially when we also need to develop practical ways of implementing positive changes. Currently, time constraints within primary care make this very difficult in individual consultations. Group consultation or shared medical appointment (SMA) approaches have been shown to be an efficient way of delivering care, increasing individuals' face-time with the clinician, with the added benefit of peer support from other group members. In the United Kingdom so far, SMAs have mainly been used to target a single condition (eg, asthma or diabetes), but they may also be an effective way to deliver lifestyle interventions.[6–10]

The design of this series of group consultations is purposely to be led by a GP with specialist expertise in lifestyle medicine. There are several benefits to this approach. Firstly, the content is expertly curated, and robustly evidence based. Secondly, it is well recognised that the interaction between doctor and patient in itself has a therapeutic effect, and studies have suggested that this may account for 30-40% of benefits gained.[11] A GP-led service will facilitate patient involvement by emphasizing the importance of lifestyle advice, where previous advice given in routine clinical care settings may have not been heeded. GPs are experienced in dealing with complex multi-morbidity and conditions with complex multifactorial contributing causes, which is frequently the case with lifestyle-related conditions. The GP can draw on their clinical experience to individualise the support given during the sessions as appropriate. This could involve proactively identifying patients who may need either extra support, and facilitate appropriate early interventions. More hopefully, for patients who are progressing well, they can be identified for down titration of current treatment and these changes can be made by the clinician without need for separate contacts with the patient's primary care team.

The purpose of this paper, therefore, is to describe an innovative group consultation programme that was designed to provide holistic lifestyle interventions in a time effective way. This took place in early 2020 in County Durham, England. The paper also sets outs the results of this pilot-scale project in terms of both the physiological outcomes and patient perceptions. The relationships between the variables within and between these two areas are also examined.

There is increasing emphasis on prevention of disease, rather than intervention once disease is established. Early intervention can reduce the progression to long-term chronic conditions for those at high risk, in a cost-effective way.[4,12] Moreover, lifestyle medicine interventions in primary care have been shown to be cost-effective.[13] Our paper also finds that lifestyle medicine intervention in primary care is cost-effective; thus, this pilot study may be used to inform the future development of such programmes, and its findings support investment in a much larger scale study to explore such interventions.

1.1 | Aims

The programme aimed to improve the patients' well-being, their confidence and motivation to make healthier lifestyle choices by attendance at a series of group consultations addressing Lifestyle medicine. Objective physiological measurements were assessed; namely weight,

blood pressure, BMI and waist circumference. Whether attendance at a Lifestyle medicine intervention improved the patient's feeling of well-being was assessed. The acceptability of group consultations for delivering this kind of intervention in terms of patient satisfaction was also examined.

2 | METHODS

2.1 | Patient recruitment

Patients were recruited from the patient population registered with the author's town-centre general practice in County Durham, a large practice (approximately 12,000 patients) serving a population with a high index of deprivation. The patient population targeted were individuals at high risk of chronic disease, that is overweight, obesity, hypertension and pre-diabetes. Patients who already had established type II diabetes were also accepted. The course was advertised within the practice, on the practice website and clinicians were encouraged to promote it to patients who they felt may benefit from this intervention. Patients could also self-refer. All patients were contacted by a healthcare assistant prior to commencing the course to explain the outline of the programme and allow potential participants the opportunity to ask for information. No patients were excluded from taking part in the programme, and places in the group were offered on a first-come basis.

2.2 | Intervention

The programme consisted of six face-to-face sessions, lasting 90 min each, between January 2020 and March 2020. It was intended that the group would consist of approximately 12 participants. Sessions were led by a GP with support from a practice nurse and a healthcare assistant.

Each session consisted of educational material being presented, together with group activities and opportunities for patients to ask questions and interact. The structure of the course was based around the key pillars of lifestyle medicine, namely nutrition, physical activity, sleep and stress management. Each week followed a dedicated theme, designed to focus on one of these pillars. The first week provided an overview and introduction, and the last week incorporating a summation and focusing on planning for continued lifestyle changes in the future by creating individualised action plans. Sessions were designed in a bespoke fashion; the aims and objectives of each session's content were tailored to the needs identified by the patients and clinician at the beginning of the course, and from feedback provided by patients after each session. Each session followed a similar structure, with a welcoming activity, outlining the aims and objectives for the session followed by a short presentation of relevant educational information and discussion of the facts and evidence behind the area of lifestyle medicine being discussed. This was built on with group discussion and interactive activities giving the patients opportunity to consider the material discussed. Provision was made for patients to have advice individualised and tailored to their particular health circumstances.

In each session, we gave participants the opportunity to have their weight and blood pressure checked. Alongside the face-to-face sessions, there was ongoing online support available via a closed private group on social media for patients to interact with each other, to provide peer-to-peer support and also ask questions of the clinicians. Patients were encouraged to contact the clinician in-between sessions via this online group with any questions or needs to be addressed in the next sessions.

The programme was designed to build connections with the wider health and well-being community. Throughout the programme, patients were signposted to local community provision and resources which could support them in their ongoing lifestyle changes. For example in session 3, focusing on physical activity, we liaised with local fitness providers. Several of the coaches attended the session to meet the participants and encourage them join community activity programmes subsequently.

2.3 | Evaluation

Prior to commencing the course, patient consent was sought for use of anonymised data to analyse the course outcomes. Patients were provided with a patient information leaflet regarding the programme and data use, and provided written consent for use of their anonymised data.

Demographic data were recorded. Patient's height, weight, BMI and blood pressure were recorded each week. The values of these physiological measures at the beginning and the end of the programme were compared.

The patient's quality of life and self-perceived wellness was measured using the EQ-5D-5L and EQ-VAS tool. The difference in scores at the beginning and the end of the programme was compared; both the overall health EQ-VAS score and each of the five individual dimensions of the EQ-5D-5L questionnaire were analysed. To give numerical values that could be compared, each dimension of the EQ-5D-5L tool (mobility, self-care, usual activities, pain/discomfort and anxiety/depression) was considered separately. For each dimension, the answers were given a numerical value between one and five, where the best perceived function or health level was given a score of one and the worst level was given a score of five. Thus, an improvement of the patient's perception of their health status in each dimension, with reduced levels of problems, would result in a decrease in their score. The EQ-VAS tool asks patients to rate their own perceived level of health from 0 (worst health imaginable) to 100 (best health imaginable); thus, an improvement in the patient's perceived health results in an increased EQ-VAS score.

Patient's self-rated motivation to make lifestyle changes, confidence to make lifestyle changes and how they perceived the importance of making lifestyle changes were assessed using questionnaires at the beginning and the end of the course. Each aspect was scored on a scale of 0-10 (0 being not at all confident/motivated/important to 10 being

extremely confident/motivated/important). The difference between these values at the beginning and end of the course was assessed and compared.

At the end of the programme, patients were additionally asked how they perceived their change in confidence and motivation, on a scale of 0 (decreased a lot) to 10 (increased a lot).

Participants were also asked how likely they were to make a change to their lifestyle as a result of attending the course, giving a rating of 0 (not at all likely) to 10 (extremely likely).

Pre- and post-programme scores were compared using the paired samples *t*-test.

Qualitative feedback was sought from all the patients both at the end of each session and at the end of the course overall. The family and friends test was asked of all participants at the end of the course.

In the initial design of the research aspect of the programme, it was intended that all participants would be followed up at 6 months and 12 months to see if they have sustained any changes seen, and to assess any longer term benefits achieved in terms of outcomes. It was also planned that the pilot course would have been run twice with two cohorts of patients to provide a larger patient group for assessment. Unfortunately, shortly after completion of the first round of the pilot scheme, the impact of the global coronavirus pandemic meant that further face-to-face group consultations could not be undertaken. Further follow-up to assess the long-term benefits of the programme was not carried out, as the effect of the pandemic is such a discontinuity in health terms that it is very unlikely the results from any further follow-up would be meaningful in comparison with those from the initial programme.

3 | RESULTS

3.1 | Demographics and participation

Thirteen patients signed up to participate in the course. Most patients were female (82% F vs 18% M). Average age was 46.5 years, ranging from 27 to 63 years.

Patient engagement and attendance was very good. Of the 13 patients initially registered, 11 patients attended four or more of the six sessions, with most of these (nine patients, 82%) attending all or five out of the six sessions; the remainder (two patients, 18%) attended four out of six sessions. The average number of sessions attended was 5.3. Two patients attended only one session and then withdrew from the programme, therefore their data were not included in the final analysis of results.

The patients who attended the course were primarily female, this is in keeping with the higher rates of engagement with healthcare for women compared to men that are seen in other areas.

Patient attendance and participation in sessions was extremely high and maintained throughout the course. This is reflected in the high motivation scores, which may indicate patients are committed to maintenance of their health behaviour change, which will lead to further improvements in health after the course has completed, leading to long-term health improvement.

Patients who made the commitment to attend a course with multiple sessions are already demonstrating significant motivation and dedication to making health improvement; they are already at the action stage of making change.[14] This high level of motivation will contribute to their positive outcomes.[15] More work will need to be done to look at how to engage patients who are earlier in the stages of change model.

3.2 | Physiological measurements outcomes

Table 1 sets out the differences between the mean values of the physiological measures at the start and the end of the programme. The table shows that weight and BMI are the only measures where the difference between mean values is statistically significant at the 5% level. This is also illustrated in Figure 1 where the 95% confidence intervals (CI) are shown as error bars on the mean differences.

Most of the patients lost weight (eight patients, 73%). Average starting weight was 110.0 kg and average finishing weight at week 6 was 108.3 kg, giving a mean weight loss of 1.7 kg (CI, −3.46 to −0.02 kg; $P = 0.048$) over 6 weeks. The mean weight loss for the patients who reduced weight was around 2.5%. Average starting BMI was 38.5 and average BMI at the end of the programme was 37.9. This gives a mean reduction in BMI of 0.56 (CI, −1.11 to −0.02; $P = 0.043$). It is to be expected that mean difference for BMI is also significant because weight is the numerator in the calculation of BMI.

The reduction in weight and BMI in the patients over the course was statistically significant. This was achieved over a fairly short time frame and further follow-up would be required to see if this improvement continued and whether it was sustained over the longer term.

Weight loss amounts were small, but this is to be expected for a short programme. Intensive lifestyle medicine programmes elsewhere have seen average weight loss of 8 kg over 6 months.[16] Therefore, the weight reductions seen in the cohort of patients in this programme are consistent with results seen in other interventions.

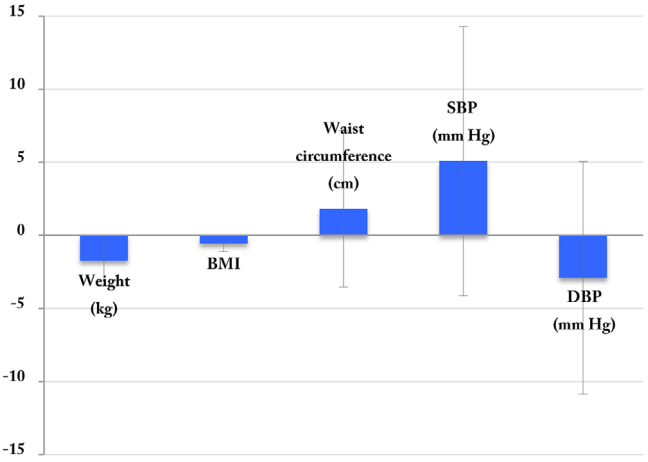

FIGURE 1 Differences between mean values of physiological measurements at baseline and follow-up

TABLE 1 Significance test of differences between mean values of physiological measurements at baseline and follow-up

Measure	Mean		Difference	SD	SE	95% Confidence interval		Significance test[a,b]	
	Baseline	Follow-up				Lower	Upper	t-statistic	P-value
Weight (kg)	110.045	108.309	−1.736	2.563	0.773	−3.458	−0.015	−2.247	0.0484
Body Mass Index	38.482	37.918	−0.564	0.805	0.243	−1.105	−0.023	−2.321	0.0427
Waist circumference (cm)	111.000	112.818	1.818	7.973	2.404	−3.538	7.174	0.756	0.4669 (NS)
Systolic BP (mm Hg)	121.818	126.909	5.091	13.722	4.137	−4.128	14.309	1.230	0.2467 (NS)
Diastolic BP (mm Hg)	75.455	72.545	−2.909	11.844	3.571	−10.866	5.048	−0.815	0.4343 (NS)

[a]Significance test is for a two-tailed test of the difference at the 5% significance level with 10 degrees of freedom.
[b]NS = not significant at the 5% level ($|t| < 2.228$, ie P-value > 0.05).
SD = standard deviation, SE = standard error.

TABLE 2 Distribution of EQ-5D-5L dimension responses at baseline and follow-up

Dimension	Baseline		Follow-up	
	n	(%)	n	(%)
Mobility				
No problems	4	(36.4)	6	(54.5)
Slight problems	5	(45.5)	5	(45.5)
Moderate problems	2	(18.2)	0	(0.0)
Severe problems	0	(0.0)	0	(0.0)
Unable to walk about	0	(0.0)	0	(0.0)
Self-care				
No problems	10	(90.9)	10	(90.9)
Slight problems	0	(0.0)	1	(9.1)
Moderate problems	1	(9.1)	0	(0.0)
Severe problems	0	(0.0)	0	(0.0)
Unable to wash or dress	0	(0.0)	0	(0.0)
Usual activities				
No problems	3	(27.3)	4	(36.4)
Slight problems	7	(63.6)	5	(45.5)
Moderate problems	1	(9.1)	2	(18.2)
Severe problems	0	(0.0)	0	(0.0)
Unable to do usual activities	0	(0.0)	0	(0.0)
Pain/discomfort				
No pain/discomfort	2	(18.2)	3	(27.3)
Slight pain/discomfort	2	(18.2)	6	(54.5)
Moderate pain/discomfort	4	(36.4)	2	(18.2)
Severe pain/discomfort	3	(27.3)	0	(0.0)
Extreme pain/discomfort	0	(0.0)	0	(0.0)
Anxiety/depression				
Not anxious/depressed	0	(0.0)	3	(27.3)
Slightly anxious/depressed	1	(9.1)	5	(45.5)
Moderately anxious/depressed	6	(54.5)	2	(18.2)
Severely anxious/depressed	2	(18.2)	0	(0.0)
Extremely anxious/depressed	2	(18.2)	1	(9.1)

Even small changes in weight may still have a significant health benefit. A weight loss of only 3–5% of initial body weight can lead to improvements in triglycerides, glucose, Hba1c and reduce risk of developing T2DM.[17]

Measurement of waist circumference is recognised as being less reliable at BMI > 35, which was the case for the majority of these patients; this may contribute to the lack of change seen in the patients' waist circumference results.

3.3 | Quality of life

The data from the EQ-5D-5L questionnaire are shown in Table 2 where the number of actual responses given for each dimension of the

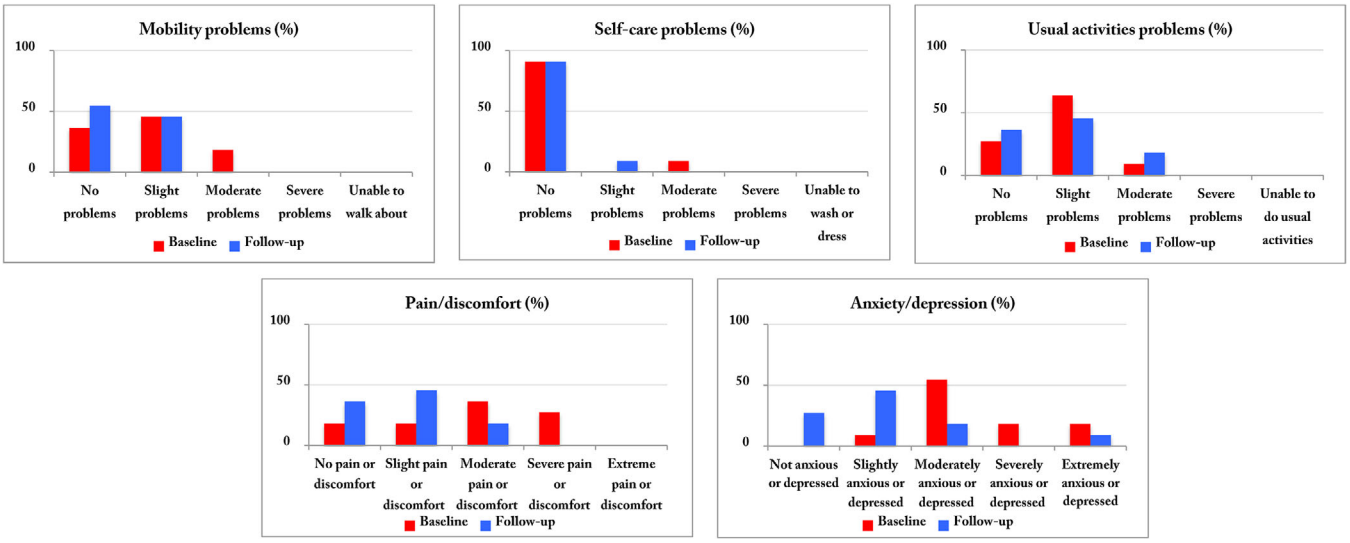

FIGURE 2 Proportion of responses by level of severity for EQ-5D-5L dimensions at baseline and follow-up

questionnaire are given, and the proportion of responses in each dimension and the change between the beginning and the end of the programme are illustrated in Figure 2.

Table 3 sets out the differences between the mean values of the EQ-VAS and EQ-5D-5L measures at the start and the end of the programme.

The average pre-course EQ-VAS score is 46.4, and the average post-course EQ-VAS score is 69.4. This represents an improvement of 23 points on the self-rating overall health scale (CI, +11.82 to +34.18; $P = 0.002$). This is a significant difference.

The components of the EQ-5D-5L questionnaire were also considered individually. For mobility, the mean pre-course score is 1.82 and the mean mobility score post-course is 1.46, showing mean reduction in mobility problems with an improvement of −0.36 (CI, −0.71 to −0.03; $P = 0.038$). Regarding pain, the mean pre-course score is 2.73 and the mean pain score post-course is 1.91, showing a mean improvement of −0.82 (CI, −1.32 to −0.31; $P = 0.005$). For anxiety/depression scores, the mean pre-course score is 3.46 and the mean anxiety/depression post-course score is 2.18, showing a mean improvement of −1.27 (CI, −1.71 to −0.84; $P = 0.0001$). The differences for the dimensions of self-care and usual activity are not significant.

Figure 3 illustrates the differences in the mean values of EQ-VAS and EQ-5D-5L dimensions scores between the beginning and the end of the programme. Figure 4 demonstrates the change in mean values of the scores and their significance can be seen from the error bars.

Patients had a greatly improved perception of their own health following participation in the course sessions. The improvement in the EQ-VAS score is supported by statistically significant improvements in three out of the five components of the EQ-5D-5L score, for anxiety/depression, pain and mobility. Improvements in these scores correlate with better quality of life for the patient. This is important as it may correlate with reduction of morbidity, and thus also result in reduced healthcare burden for the individual, which then leads to reduced healthcare costs overall.

TABLE 3 Significance test of differences between mean values of EQ VAS and EQ-5D-5L dimensions scores at baseline and follow-up

	Mean					95% Confidence interval		Significance test[a,b]		
	Baseline	Follow-up	Difference	SD	SE	Lower	Upper	*t*-statistic	*P*-value	
EQ VAS (Min = 0; Max = 100)										
Overall health	46.364	69.364	23.000	16.643	5.018	11.819	34.181	4.583	0.0016	
EQ-5D-5L (Min = 1; Max = 5)										
Mobility	1.818	1.455	−0.364	0.505	0.152	−0.703	−0.025	−2.390	0.0379	
Self-care problems	1.182	1.091	−0.091	0.302	0.091	−0.293	0.112	−1.000	0.3409	(NS)
Usual activities problems	1.818	1.818	0.000	0.775	0.234	−0.520	0.520	0.000	1.0000	(NS)
Pain/discomfort	2.727	1.909	−0.818	0.751	0.226	−1.323	−0.314	−3.614	0.0047	
Anxiety/depression	3.455	2.182	−1.273	0.647	0.195	−1.707	−0.838	−6.528	0.0001	

[a]Significance test is for a two-tailed test of the difference at the 5% significance level with 10 degrees of freedom.
[b]NS = not significant at the 5% level ($|t| < 2.228$, ie P-value > 0.05).
SD = standard deviation, SE = standard error.

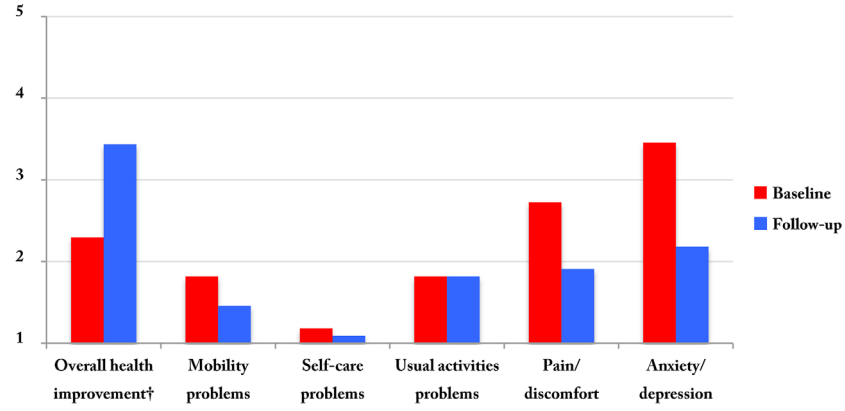

FIGURE 3 Mean values of EQ-VAS and EQ-5D-5L dimensions scores

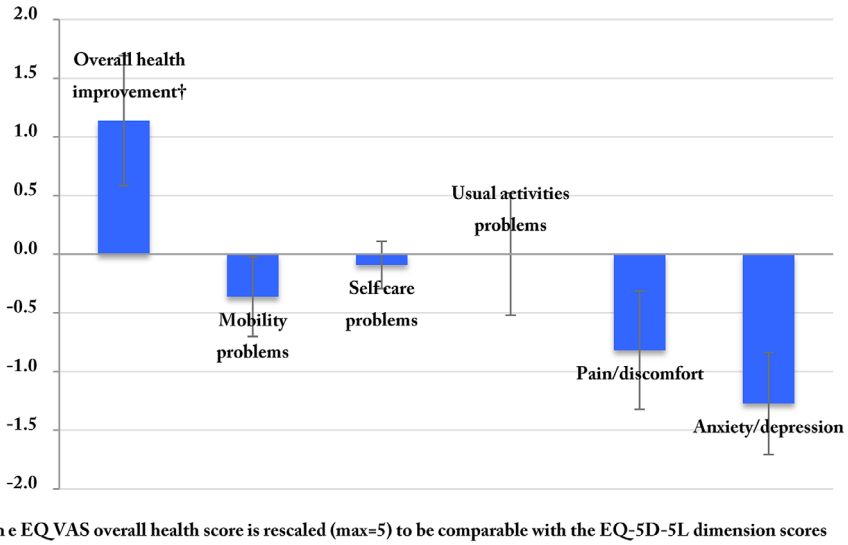

FIGURE 4 Differences between mean values of EQ-VAS and EQ-5D-5L dimensions scores at baseline and follow-up

3.4 | Patient confidence and motivation to make lifestyle changes

Figure 5 shows the mean values of the patient's self-reported scores for confidence and motivation to make lifestyle changes, and for the importance of making such changes, at the beginning and end of the programme. Table 4 and Figure 6 set out the significance test of differences between mean values of patient perceptions scores at baseline and follow-up.

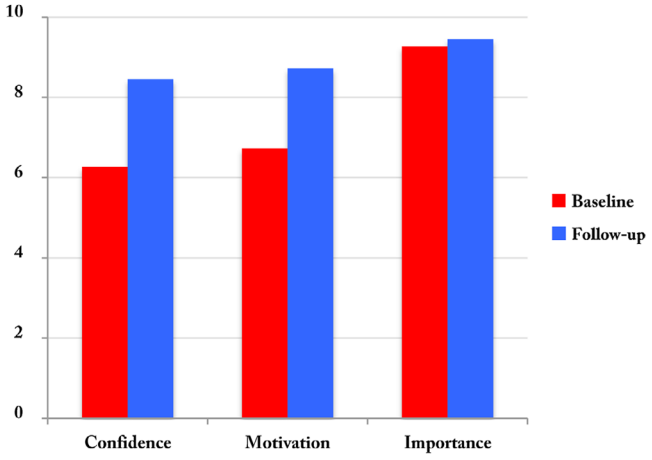

FIGURE 5 Mean values of patient perceptions scores

For patient's confidence to make lifestyle changes, the mean score at the beginning of the course was 6.27 and the mean score at the end of the course was 8.46. The difference between starting and finishing scores is an increase in confidence score of +2.18 (CI, +0.72 to +3.65; $P = 0.008$). For patient motivation to make lifestyle changes, the mean score at the beginning of the programme was 6.73 and the main score at the end of the programme was 8.73. The difference between starting and finishing scores is an increase in motivation score of +2.0 (CI, +0.30 to +3.70; $P = .026$). The increases in the patients' scores for confidence and motivation to make lifestyle changes are both significant.

The increase in the patients' perceived importance in making lifestyle changes is not significant. However, this is not really surprising as at the beginning of the programme the mean scores showed that patients already rated the importance of making lifestyle changes very highly, and this did not change over the duration of the programme.

TABLE 4 Significance test of differences between mean values of patient perceptions scores at baseline and follow-up

	Mean[a]					95% Confidence interval		Significance test[b,c]		
	Baseline	Follow-up	Difference	SD	SE	Lower	Upper	*t*-statistic	*P*-value	
Confidence	6.273	8.455	2.182	2.183	0.658	0.716	3.648	3.315	0.008	
Motivation	6.727	8.727	2.000	2.530	0.763	0.300	3.700	2.622	0.026	
Importance	9.273	9.455	0.182	0.982	0.296	−0.478	0.841	0.614	0.553	(NS)

[a]Patient perceptions scores: Min = 0; Max = 10.
[b]Significance test is for a two-tailed test of the difference at the 5% significance level with 10 degrees of freedom.
[c]NS = not significant at the 5% level ($|t| < 2.228$, ie P-value > 0.05).
SD = standard deviation, SE = standard error.

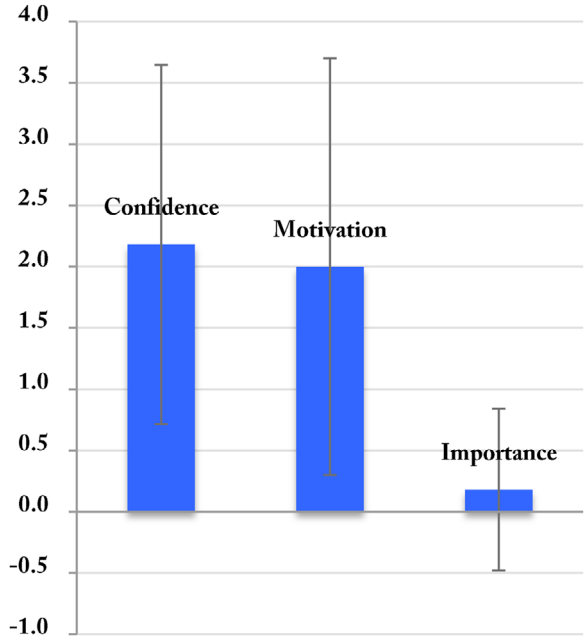

FIGURE 6 Differences between mean values of patient perceptions scores at baseline and follow-up

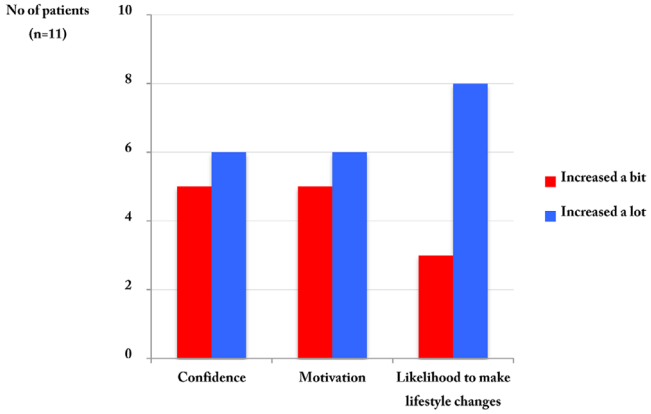

FIGURE 7 Self-rated changes in patient perceptions

3.5 | Patient self-rated perception of confidence, motivation and likelihood to change

At the end of the programme, patients were also asked to self-rate the change in their confidence and motivation as a result of their attendance, and the likelihood that they would make changes as a result. Figure 7 shows that all patients reported that their confidence increased as a result of attendance: five out of 11 patients reported that their confidence 'increased a bit', and six out of 11 patients reported that their confidence 'increased a lot'. Similarly, all of the patients reported an increase in their motivation: five patients reported that their motivation 'increased a bit' and six patients reported that their motivation 'increased a lot' as a result of attending the programme. All patients reported that they were either 'likely' or 'very likely' to make changes to their lifestyle to improve their health after attending the programme.

3.6 | Patient satisfaction

Patients were asked to rate how useful they found the course; in response, all rated the course as 'very useful' (4/11, 36%) or 'extremely useful' (7/11, 64%). Patients were also asked to state how likely they were to recommend this programme to friends and family. Patient satisfaction was very high; all patients reported finding the course either 'very useful' or 'extremely useful', and all reported themselves as 'extremely likely' to recommend it to family and friends. This indicates a high level of acceptability for delivering health-related lifestyle advice in this format.

3.7 | Relationship between patient health perceptions and weight

The above results raise the possibility that patients' perceptions of their overall health respond directly to changes in their weight or BMI, especially as these measures are readily understood and open to self-monitoring by patients. Regression analysis was used to investigate whether such a relationship could be discerned, even in this small sample of 11 patients. Details of the analysis are set out in the Appendix A.

The regression analysis shows that there is a statistically significant relationship between the change in patients' perceptions of their

overall health, as given by their EQ VAS scores, and the percentage change in their weight over the 6-week period. The estimated relationship implies that a 1% reduction in weight is associated with an increase in the perceived overall health score of around five points. The analysis was repeated using the percentage change in the patients' BMI instead and similar results were obtained, as would be expected because weight is also the numerator in the calculation of BMI. Here, a 1% reduction in BMI results in about a six-point increase in the overall health score.

However, in statistical terms, each of the estimated relationships only explains about a third of the variation in the overall health score, suggesting that other factors are likely to be involved. The relationships were, therefore, re-estimated to examine the potential effects of demographic factors. Gender, age and marital status were tested, but none of these factors were found to be significant.

3.8 | Relationships among confidence, motivation and health perceptions

The previous results also suggest that the increase in both the confidence and motivation of patients to make lifestyle changes by the end of the programme might have resulted directly from their perceptions of the increase in their overall health. Regression analysis was again used to test whether such relationships could be detected, even in this small sample. Details of the analysis are set out in the Appendix A.

The analysis shows that there are statistically significant relationships between the changes in the patients' scores for both confidence and motivation, and the changes in their EQ VAS scores over the 6-week period.

As the maximum EQ VAS score is 100 and that of the scores for both confidence and motivation is 10, the results imply that an estimated increase of 10 points in the EQ VAS score is associated with an increase of similar proportions for the motivation score, whereas for the confidence score it is around 30% lower. The variation in the EQ VAS score accounts for around 43% of the variation in the confidence score and two thirds of the variation in the motivation scores. The potential effect of demographic factors was analysed but, as before, none were found to be significant. The effect of the patients' change in weight on their confidence and motivation scores was also examined because it appears to be a significant factor affecting perceptions of overall health, but it was not found to be significant in these relationships. Presumably, this is because it is unlikely to be the only factor involved in the formation of health perceptions.

3.9 | Cost-effectiveness

The cost-effectiveness of the programme is analysed by calculating its Cost per QALY (Quality-Adjusted Life Year) ratio based on an economic assessment of health service costs and the responses to the EQ-5D-5L questionnaires. The cost calculations represent the incremental cost of the programme beyond the continuation of existing pharmacological treatments and no other interventions.

TABLE 5 Incremental cost of the programme

	Hours	Hourly rate	
		£	£
Staff costs			
General practitioner	24	75	1800
Nurse	12	28	336
Health care assistant	12	20	240
Administration			150
Facilities			
Meeting room	24	25	600
Supplies and materials			74
Total			3200
Cost/Patient			290

3.10 | Resource costs

Although no additional financial costs were incurred, as all staff costs were accommodated within existing workloads and existing rooms and facilities were used, an economic assessment requires the opportunity cost of the health service resources used by the programme to be estimated. The incremental resource costs are summarised in Table 5. The costs were incurred over a 7-week period and so have not been discounted. The initial investment in design and development costs is excluded as it is non-recurring and would not, therefore, be repeated in further programmes. Societal costs were negligible.

3.11 | EQ-5D-5L and QALYs

HRQoL (Health Related Quality of Life) utilities at the beginning and the end of the programme were calculated using the responses to the EQ-5D-5L questionnaires. The calculation method followed the procedure recommended by NICE (National Institute for Health and Care Excellence). Value weights are applied to the patients' scores for each of the five levels in each of the five dimensions in the questionnaire, the total of which is then the patient's HRQoL utility at that time. Unfortunately, at the time of writing a reliable EQ-5D-5L value set is not available, so NICE has recommended that the earlier EQ-5D-3L value set be used and converted to a 5L value set using the mapping function derived by Van Hout et al.[18,19] EQ-5D-5L Index Values based on this mapping function and obtained from the EuroQol crosswalk calculator[20] were, therefore, used as the patients' HRQoL utilities.

The means of the patient HRQoL utilities at the beginning and the end of the programme were 0.518 and 0.709, and the 0.191 improvement between these means was statistically significant (CI, +0.08 to +0.30; $P = 0.004$). Consequently, over the 35 days of the programme, the total QALY's gained (assuming a linear rate of improvement) was

TABLE 6 Illustrative calculations of QALYs gained and cost per QALY

	Actual	Total after decay period	
	After 35 days	18 months	4 years
QALYs gained	0.101	1.674	4.297
Cost per QALY (£)	31813	1911	745

0.101, giving a cost per QALY of nearly £32k, but this figure assumes that the benefit of the programme ceases at the end of the intervention, which is not the case. There will clearly be a continuing health benefit beyond the end of this programme leading to additional QALYs, but it would be unduly optimistic to assume this level of improvement would continue for the remainder of the patients expected lives without any further intervention. Although no follow-up data on the patients are available for the reasons explained above, it is possible to make some illustrative calculations of the future health gains based on research into the rate of decay of benefits obtained from other intensive lifestyle interventions.

A study following 348 participants in a 4-week educational course in Rockford, Illinois found that although the biggest improvements in behaviour occurred at 6 weeks, there were still significant improvements after 18 months.[20] Another study of 248 individuals in a 30-day lifestyle intervention programme in Hawara, New Zealand found statistically significant improvements in biometrics at the end of the programme, and that after 3-5 years the weight reduction, although smaller, was still significant, amounting to about 35% of the mean weight reduction achieved at the end of the programme.[21]

Illustrative calculations of the potential QALYs that might be gained from this programme with decay periods of 18 months and 4 years have been made using the 'area under the curve' method and were based on the relatively conservative assumptions that the benefit wholly disappears at the end of the relevant period and that the rate of decay is constant.[22] The results are set out in Table 6.

3.12 | Cost per QALY

If the benefits of the programme are maintained over the long term, then it is possible that existing pharmacological treatments could be reduced, and in some cases eliminated. Even if there are further more limited follow-up programmes to constrain behaviour decay, the (undiscounted) cost per QALY estimates in Table 6 suggest that the Incremental Cost Effectiveness Ratio of this kind of programme could be within the current NICE threshold of £20-30k for new technologies. For the conservative estimate that effect would be disappeared by 18 months, the cost per QALY is £1911, and if effect is maintained up to 4 years, as seen in other studies, cost per QALY reduces to £745, both of which are very much below the NICE threshold. Indeed, it is possible that this intervention could dominate existing treatments by offering greater health benefits at lower cost.

3.13 | Cost benefits

Cost benefits from improved health outcomes include reduced medication costs, reduced need for follow-up appointments and reduced need for hospital specialist care. Cost benefit such as medication savings would be likely seen over longer term, rather than immediately during the programme itself because sustained improvements are needed for down-titration of most medications. It was not possible to carry out this longer term follow-up due to reasons mentioned above, but it is possible that these cost benefits could more than off-set the costs incurred, particularly for diabetic patients if they can achieve remission.

4 | DISCUSSION

This programme was specifically designed to be led by a physician with an interest in the area of Lifestyle Medicine. This is important because having a GP leading the programme means that the complex multi-morbidity of patients with multiple long-term conditions can be taken into account and tailored specific advice can be offered and adjusted according to patient's individual need. Medication adjustment and review relevant to the lifestyle changes made can be done responsively during group consultations, without need for additional appointments, thus reducing the burden on the wider healthcare system. Specialist clinical leadership provides support, education and training and supervision to allied health professionals involved in the delivery of sessions.

This programme helped patients make adjustments to the areas of lifestyle which they identified as their most pressing need. Equal emphasis was given to each pillar of lifestyle medicine, and patients were encouraged to make changes which suited their individual goals. This holistic approach resulted in improvement in overall well-being.

This is important because educating participants on health behaviours could change their locus of control beliefs from external to internal. There is significant improvement in both the patient's confidence in their ability and their motivation to make lifestyle changes to improve their health from the beginning to the end of the programme. This would predict better future outcomes by allowing the participant to feel in control of their health, rather than having the perception that their health problems stem from outside, unchangeable influences. Improving the internal locus of control heightens ability to cope with events such as lifestyle change, empowering and giving confidence.[23,24] In turn this may lead on to sustained longer term health improvement.

There is a complex inter-relationship among the patients' perception of well-being, their confidence and motivation to make lifestyle changes and their objective physiological parameters. This is confirmed by the regression results, which demonstrate a positive relationship between health perception and reductions in weight.

Although simple regression results from a very small-scale pilot programme are not conclusive, they suggest that weight plays a significant role in the formation of patients' perceptions about their

Case study – Patient journey

Mr N is a 59-year-old man who joined the programme as part of a new year resolution to get in control of his health. Prior to starting the programme, he had uncontrolled diabetes, fatty liver, hyperlipidaemia, hypertension (controlled with medication), CKD, obesity class 1, OSA and joint pains which limited his activity to walking less than half a miles at a time.

At the time of commencing the programme, his vital signs were as follows: weight = 105.1 kg, BMI = 34.2, BP = 118/70 (on medication) and Hba1c = 116. His medication included long-acting insulin (tuojeo) 80 units OD, plus short-acting insulin (novorapid) with meals, atorvastatin and candesartan.

Mr N attended five out of six sessions of the course, and actively engaged with the online group. He had also joined weight watchers for ongoing peer support and access to regular weigh-ins, although he did report that he did not like the weight-watcher's 'diet' and preferred to follow a low-carbohydrate approach and advice given during the programme.

Throughout the programme, his blood sugar levels were monitored by the patient, and his insulin dose was down-titrated by the programme's GP clinical lead (CG) to keep in line with his blood sugar levels, as his requirements changed following conversion to a lower carbohydrate diet.

Halfway through the course his anti-hypertensive medication (candesartan) was stopped by CG, as although his clinic readings were normal, he developed episodes of symptomatic hypotension, with home readings of <100 mmHg systolic at the time.

By the end of the course, weight was down to 99.7 kg (weight loss of 5.4 kg), BMI was 30.7 and BP was 126/68 (off medication).

Mr N had a further routine diabetic follow-up appointment in May 2020: he was able to stop his insulin (tuojeo) at that point. Vital signs in May 2020 were as follows: weight = 90.3 kg, BMI = 27.8 (overweight) and Hba1c = 47. He had moved from being class1 obese to overweight, and from uncontrolled diabetes into the pre-diabetic range. He reported feeling much better, having increased his physical activity and going to the gym regularly (three to four times per week). His joint pains had improved and he was attending the ability to walk briskly for 1.5 miles. He also noted that his sleep was improved. Mr N reported that the programme had helped his understanding of why different aspects of lifestyle were important, which helped his motivation for making changes. At his most recent review, he expressed an intention to maintain these changes, with the hope of continuing to lose some more weight, increase his activity levels further and maintain remission of his diabetes.

overall health. The results also indicate a correlation between the participants' health perceptions and their confidence and motivation. Taken together, these results are promising as they suggest that a programme like this, by improving patients' lifestyle practices and reducing their weight, can have a significant effect on patients' health perceptions. In turn, improved health perceptions could directly increase their confidence and motivation to make more lifestyle changes in the future. The theory of positive psychology suggests that small positive changes are important for patient confidence and motivation, so this initial positive outcome with regard to weight loss may help with continued patient motivation and confidence to continue to maintain positive lifestyle changes.

The results of the statistical analysis reinforce the case for a more extensive investigation into the relationship between patient perceptions and actual health outcomes and their longer term sustainability. More extensive statistical analysis and tests could then be carried out, revealing more about the interactions between the multiple factors that can affect patient perceptions of their health, including not only physiological indicators but the lifestyle practices that a programme like this aims to address.

Overall, this pilot study shows that holistic lifestyle-medicine health advice delivered via a group consultation approach leads to improvements in both physiological parameters and patient's perceived well-being. If these improvements are maintained, then it will lead to significant benefits, both for individuals, but also the health economy as there may be lower patient attendance in future, and health-related costs are reduced. The cost-effectiveness of healthy lifestyle improvement has been demonstrated in other studies elsewhere.[4,12] Our analysis suggests that this approach could be similarly cost-effective, with a relatively low-cost intervention resulting in significant QALYs gained and reduced future healthcare burden. These initial results support further investigation on a larger scale, with longer follow-up to allow further assessment of the cost-effectiveness.

Despite the inability to follow-up the longer term outcomes (due to the coronavirus pandemic restrictions), the results of this pilot study are very encouraging in terms of the potential for both health improvement and the related health psychology. A more extensive programme would provide opportunity to learn more about the relationships between patient perceptions and their actual health outcomes. A larger study would also enable longer term follow-up to assess the sustainability of changes made. For future iterations of this programme, consideration will have to be given to the current limitations on delivering care following the global pandemic. One possibility could be the use of technology to deliver sessions remotely, via virtual group consultations, which in itself has both benefits and drawbacks.

5 | CONCLUSION

This pilot project demonstrated improvements in the patients' perceived health and well-being, along with reductions in weight, and reduced problems with mood and pain. The participants engaged well with the course, with very positive feedback about the course itself,

and reported high levels of improved motivation and confidence. This suggests that lifestyle health advice delivered in a group setting with a holistic approach looking at all aspects of lifestyle medicine empowers patients to make positive lifestyle changes. Having a GP-led overarching approach enables holistic formulation of individualised action plans which take into account the complexity of each patient's needs, resulting in positive changes led by the patient that, in turn, lead to significant improvements in well-being. Our analysis shows that delivery of care in this way is cost-effective. The positive findings from this pilot-scale study support investment in a larger study to further develop and explore delivery of lifestyle medicine intervention in this way.

APPENDIX A: REGRESSION ANALYSIS

Relationship between patient health perceptions and weight

An equation of the following form was estimated as follows:

$$\Delta OH_i = \beta \Delta W\%_i + u_i,$$

Where ΔOH_i is the change in EQ VAS score for overall health of patient i, $\Delta W\%_i$ is the percentage change in the patient's weight, u_i is an error term, and $i = 1, \ldots, 11$.

A constant term was excluded on the assumption that patient perceptions of their health would not otherwise change over the 6-week period of the programme (except for random variations). Simple ordinary least squares (OLS) regression was used to estimate the coefficient β. In addition, a second equation of the same form was estimated in which $\Delta BMI\%_i$, the percentage change in the patient's BMI, was used instead as the independent variable. The results for both equations are set out in Table 7.

The coefficient of the percentage change in weight is significant at the 5% level (since $|t| > 2.228$). Similar results were obtained when the change in BMI was used instead as the independent variable. This is to be expected as weight is the numerator in the calculation of BMI, making the two variables $\Delta W\%_i$ and $\Delta BMI\%_i$ highly collinear ($R = 0.95$).

Both equations were re-estimated with the addition of dummy variables to allow for the effect of demographic factors. Variables for gender, age and marital status were tested individually in separate regressions, but none were found to be significant. There was virtually no variation in ethnicity in the sample.

Relationships between confidence, motivation and health perceptions

An equation of the following form was estimated as follows:

$$\Delta CON_i = \beta_1 \Delta OH_i + u_i,$$

where ΔCON_i is the change in the patient's score for confidence about making lifestyle changes and the other variables are as described in the previous section. In addition, two further equations of the same form were estimated using ΔMOT_i and ΔIMP_i instead as the dependent variable; the former being the change in the patient's score for motivation to make lifestyle changes and the latter being the change in the patient's score for the importance of making such changes. The coefficients of ΔOH_i in each of the three equations (viz. β_1, β_2 and β_3, respectively) were estimated using simple OLS and results are summarised in Table 8.

The table shows that the estimated coefficients of the change in overall health in the first two equations (β_1 and β_2) were both significant. The estimated coefficient in the third equation (β_3) was not significant, as would be expected because there was no significant difference between the means of the patients' importance scores.

The three equations were re-estimated including dummy variables as before, but again none were significant.

Further regression results were obtained using the percentage change in weight ($\Delta W\%_i$) instead as the independent variable in each

TABLE 7 OLS estimates of relationship between patient health perceptions, weight and BMI

			95% Confidence interval		Significance test		
Independent variable	Coefficient	SE	Lower	Upper	*t*-statistic	*P*-value	R^2
$\Delta W\%_i$	−5.403	2.402	−10.755	−0.051	−2.249	0.0482	0.336
$\Delta BMI\%_i$	−6.490	2.674	−12.449	−0.531	−2.427	0.0356	0.371

SE = standard error.

TABLE 8 OLS estimates of relationships between confidence, motivation, importance and health perceptions

			95% Confidence interval		Significance test[a]		
Dependent variable	Coefficient of ΔOH_i	SE	Lower	Upper	*t*-statistic	*P*-value	R^2
ΔCON_i	0.071	0.026	0.014	0.128	2.757	0.0202	0.432
ΔMOT_i	0.091	0.021	0.045	0.137	4.398	0.0013	0.659
ΔIMP_i	0.005	0.011	−0.019	0.029	0.491	0.6338 (NS)	0.024

[a]NS = not significant at the 5% level ($|t| < 2.228$, ie P-value > 0.05).
SE = standard error.

equation because this factor appears to have a significant effect on patients' perceptions of overall health. However, no significant results were obtained. This might be expected because the results in the previous section show that weight is unlikely to be the only factor affecting patients' health perceptions. The percentage change in weight was also not found to be significant when included as an additional independent variable in each of the three equations.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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