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Take your pick - weight loss or clothes size goal: A longitudinal exploration of outcomes in individuals following laparoscopic adjustable gastric banding

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Abstract

Objective: Laparoscopic adjustable gastric banding (LAGB) is a type of bariatric surgery. Individuals find setting a goal following LAGB useful as part of rehabilitation; however, it is unclear which type of goal is likely to benefit individuals most. This study explored long-term outcomes comparing two goal groups.

Design: A longitudinal study collecting data prior to LAGB surgery, then annually until five years post-surgery from 38 individuals. Based on their pre-surgical goal, individuals were assigned to one of two goal groups (weight loss or clothes size). Data were analysed using repeated measures ANOVAs and t-tests.

Main outcomes measures: Objectively measured weight, and self-reported measures of appearance using validated scales (Salience and Valance Appearance Questionnaire, and Derriford Appearance Scale).

Results: From pre-LAGB to five years post-surgery significant differences were found in all the objective and subjective measures, however, no differences between goal groups were present.

Conclusion: This is the first study to explore the long-term impact of two different goals following LAGB surgery. Although setting a specific goal maybe useful for an individual, this study suggests no differences in outcomes between individuals who set a weight loss or clothes size goal. Clinicians should work with an individual to help them achieve their own personal goal as part of rehabilitation following surgey.

Abbreviations and symbols: ANOVA: Analysis of Variance; BMI: Body Mass Index; CARSAL: Centre for Appearance Research Salience Appearance Questionnaire; CARVAL: Centre for Appearance Research Valance Appearance Questionnaire; COREC: Central Office for *Research Ethics* Committee; d: Cohen's d; DAS-24: Derriford Appearance Scale 24-items; et al: and others; kg/m^2: Kilogram/square metre; LAGB: Laparoscopic adjustable gastric banding; LOCF: Last Observation Carried Forward; n: Number; N/A: Not Applicable; NHS: National Health Service; NICE: National Institute for Health and Care Excellence; p: Probability; %EBWL: Percentage Excess Body Weight Lost; SD: Standard Deviation; UK: United Kingdom; ±: Plus/Minus; =: Equals; <: Less than

Introduction

Some individuals are unable to successfully lose and maintain weight using behavioural modification [1], and for these individual's bariatric surgical intervention may be required to assist with weight loss [2,3]. There are a number of bariatric surgical procedures, which fall broadly into two categories; restrictive (e.g., laparoscopic adjustable gastric banding [LAGB]) and **malabsorptive (e.g., gastric bypass)** [2,4]. The bariatric surgery is only a tool to assist with weight loss; following surgery individuals are still required to change eating and lifestyle behaviours in order to achieve results [5]. Patient-centred rehabilitation following bariatric surgery is crucial to achieving positive long-terms outcomes [6].

Funnell, Anderson and Ahroni argue that "to manage bariatric surgery successfully, patients must be able to set goals and make frequent daily decisions that are both effective and fit their values and lifestyles, while taking into account multiple physiological and personal psychosocial factors" [7]. Unrealistic expectations of weight loss following surgery, and setting unachievable goals, are common [8-13]. Typically, the focus for the clinical team and individuals undergoing surgery is a weight loss goal following LAGB [14], as a reduction in 5-10% of excess body weight can lead to significant health improvements [15]. However, it can be difficult to predict how much weight an individual will lose following LAGB [16]. Goals other than weight loss may need to be considered following LAGB [17].

In combination with other behavioural change techniques, goal setting is a primary feature of weight loss interventions [18-20]. The goal setting literature for weight loss suggests setting specific goals which challenge an individual, but at the same time are achievable, are

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likely to be the ones that are attained [21]. To be effective, an individual need to set a realistic weight loss goal [20], and monitor their progress [22]. Goals may be proximal (short-term) or distal (long-term) [21]. Typically, goals are set in terms of losing a specific amount of weight over a set timeframe [1,19].

Body dissatisfaction is common in overweight individuals [23,24]. Portrayals of 'normal' shaped bodies in the media [25,26], and social stigma toward overweight individuals can contribute to an overweight individual's feelings of discontent with their body [27,28]. Weight loss can help overweight individuals become more satisfied with their appearance [29-31]. Reducing weight, and therefore becoming a 'normal' size following bariatric surgery, is a goal for many individuals [32-34]. Although many people are satisfied with their reduced body size following bariatric surgery, there are those who remain dissatisfied, often due to excess skin as a result of their weight loss [35,36].

There is a large body of literature demonstrating that bariatric surgery, such as LAGB, has positive physical and mental health benefits for individuals [2,3,15]. Lacking is literature exploring the long-term impact of pre-surgical goal choices on individuals undergoing this type of surgery. Generally following bariatric surgery, the goal for both the individual and clinical team is weight loss [2,11], however, some individuals prefer to focus on reducing body size rather than weight [37,38]. Currently, it is unclear whether an individual's pre-surgical goal choice impacts on their long-term weight loss success, or perception of their appearance. Determining whether proximal weight loss or clothes size goals achieve better results for individuals undergoing LAGB surgery long-term is important. Understanding which goals achieve better results will help to guide individuals considering LAGB in the future, and enable clinicians to advise their patients on possible outcomes following surgery.

The current study used data collected as part of a longitudinal mixed methods study, in order to perform secondary analysis, which is an effective way to maximise insights from existing data [39,40]. During analysis of the semi-structured interview data prior to surgery, it was noted that a number of participants spoke of either having a proximal weight loss or clothes size goal. This prompted the formulation of the following question: "Is there a difference in long-term outcomes depending on the pre-surgical goal?" The aim of the current study was to determine whether a weight loss or clothes size goal prior to LAGB surgery resulted in greater weight loss at five years following surgery. In addition, the impact of setting a weight loss or clothes size goal on body satisfaction in terms of appearance was also explored.

Method

Design

This longitudinal study collected data at seven times; pre-operatively, six months post-operatively, then annually until five years post-LAGB.

Participants

Participant eligibility and study setting has been described elsewhere [41,42]. The sample of 38 individuals (31 female) were aged between 32 and 60 years old (mean ± standard deviation (SD); 45.2 ± 7.2), one participant stated their ethnicity as Indian the others identified themselves as White. Participants were assigned to one of two groups based on their pre-LAGB goal; weight loss (n=22) or clothes size (n=16).

Measures

Salience and Valance Appearance Questionnaire (CARSAL & CARVAL): This questionnaire consists of 13 items, divided into two clearly distinct subscales measuring the salience and valence of appearance (CARSAL; seven items focussed on the importance and extent to which an individual think about appearance, i.e., salience, and CARVAL; six items focussed on how the individual feels about their appearance, i.e., valence) [43]. Responses are on a 6-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree), with five items being reverse scored. Higher scores on the CARSAL subscale indicate a more positive view of the self while higher scores on the CARVAL subscale indicate a more negative evaluation of one's appearance. In terms of internal scale reliability, in the current sample, the questionnaire's Cronbach's alpha was .80 pre- and .91 five year post-operatively, which compares favourably with the original scale development alpha score of 0.90.

Derriford Appearance Scale (DAS-24): This scale consists of 24 items that assess emotional and behavioural difficulties experienced by individuals with problems of appearance. Responses options vary between questions, and are on a 4-point Likert scale ranging from 1 (not at all or never/almost never) to 4 (extremely or almost always), with 11 items having a 'not applicable' [N/A] option [44]. Higher scores on the scale indicate more problems associated with social avoidance as a result of appearance concerns. In relation to internal scale reliability, in the current sample, the questionnaire's Cronbach's alpha was .92 pre- and .96 five year post-operatively, which compares favourably with the original scale development Cronbach's alpha of 0.92.

Weight

Participants were weighed on calibrated scales at each data collection point; weight was recorded in kilograms (kg).

Procedure

Ethical approval for this study was given by National Health COREC (REC Ref: 06/Q2002/38). Written informed consent was obtained prior to data collection. Individuals were invited for an interview and given questionnaires to complete at each data collection point. Interviews were recorded and transcribed verbatim [45]. Quantitative data were entered into SPSS version 22 for analysis [46]. To ensure anonymity, participants were assigned numbered identifiers. In order to assign participants to a goal group, pre-LAGB surgery interviews were read to determine whether individuals spoke about a long-term weight loss or clothes size goal.

Data analysis

Descriptive statistics (mean and standard deviation) were calculated at each data collection point. The last observation carried forward (LOCF) method was applied for any missing data [47]. The number of participants whose data were carried forward was calculated and an average percentage LOCF calculated for the three psychometric measures at each data collection time point. Body Mass Index (BMI, kg/m^2) and percentage excess body weight lost (%EBWL) were calculated for each data collection point following LAGB surgery using recommended methods [48,49]. Repeated measures ANOVAs were undertaken to explore changes over time between the two goal groups; a 7 (weight at each time point) x 2 (goal: weight vs. clothes size), a 7 (BMI at each time point) x 2 (goal: weight vs. clothes size), a 6 (%EBWL at each time point) x 2 (goal: weight vs. clothes size), a 7 (CARSAL at each time point) x 2 (goal: weight vs. clothes size), a 7 (CARVAL

at each time point) x 2 (goal: weight vs. clothes size), and a 7 (DAS-24 at each time point) x 2 (goal: weight vs. clothes size). To explore differences within goal groups, paired sample t-test analyses were used.

Results

Missing data

From six months to five years post-LAGB it was necessary to apply LOCF at all time points for the psychometric data. The percentages applied at each time point were as follows; 11.4%, 13.2%, 38.6%, 26.3%, 36.8% and 42.1% respectively.

Weight analysis

Table 1 shows the mean weight, BMI and %EBWL of the two goal groups during the data collection period. At baseline an independent t-test showed the two goal groups were similar in weight, t (36) =-0.2, p=0.84. Figure 1 indicates that up until one year post-LAGB both goal groups lose weight, then from one to three years post-LAGB the weight loss goal group continues to lose weight, whereas the clothes size goal group appear to plateau. From three to five years post-LAGB the pattern appears to change with the clothes size goal group losing weight and the weight loss goal group gaining weight before plateauing. Repeated-measures ANOVA analysis showed there was a difference in weight over the five years, F (6, 31) =19.7, p <0.001, but no difference was observed between the weight and clothes goal groups, F(6, 31)=1.8, p=0.11. Using Cohen's d [50] to calculate the effect size of the mean difference in weight measures between six months and five years post-LAGB, findings revealed a medium effect size (d=0.52), with a difference in weight loss of 26.5kg in the sample during this timeframe. Exploration of the effect size of the mean difference in weight measures at five years post-LAGB revealed a small effect size for weight (d=0.13), with the clothes size goal group weighing 2.9 kg less than the weight loss goal group.

For BMI, the analysis showed there was a difference in BMI over the five years, F(6, 31)=18.5, p<.001, but no difference was observed between the weight and clothes goal groups, F(6, 31)=1.4, p=0.25. Calculation of the effect size of the mean difference in BMI measures between six months and five years post-LAGB revealed a medium effect size (d=0.57), with a difference in BMI of 4.7kg/m^2 in the sample during this timeframe. Exploration of the effect size of the mean difference in BMI between the two goal groups at five years post-LAGB revealed a negligible effect size (d=0.06), with the weight loss goal groups' BMI 0.6kg less than the clothes size goal group.

Finally, for %EBWL, the analysis showed there was a difference in EBWL over the five years, F(5, 32)=9.9, p<.001, but no difference was observed between the weight and clothes goal groups, F(5, 32)=1.8, p=0.14. Calculation of the effect size of the mean difference in %EBWL measures between six months and five years post-LAGB revealed a very large effect size (d=1.1), with a difference in %EBWL of 18.8 in the sample during this timeframe. Exploration of the effect size of the mean difference in %EBWL between the two goal groups at five years post-LAGB revealed a small effect size (d=0.2), with the weight loss goal groups' %EBWL 3.3kg greater than the clothes size goal group.

Exploring differences in these weight measures within groups, paired sample t-test analyses demonstrated that between six months and five years following surgery in both the weight loss and clothes size groups, there was a significant difference for weight (t(21)=5.5, p<0.001 and t(15)=6.6, p<0.001, respectively), BMI (t(21)=5.4, p<0.001 and t(15)=6.2 , p<0.001, respectively), and %EBWL (t(21)=- 3.1, p=0.005 and t(15)=-4.1, p=0.001, respectively).

Psychometric analysis

Table 2 shows the mean CARVAL, CARSAL, and DAS-24 scores from the two goal groups during the data collection period. The repeated-measures ANOVA analysis showed there was a difference in CARVAL score over the five years, F(6, 31)=5.3, p=0.001, but no difference was observed between the weight and clothes goal groups, F(6, 31)=0.2, p=0.96. Calculation of the effect size of the mean difference in CARVAL scores between pre-LAGB and five years post-LAGB revealed a medium effect size (d=0.5), with a difference in CARVAL scores of 8.1 in the sample during this timeframe. Exploration of the effect size of the mean difference in CARVAL scores between the two goal groups at five years post-LAGB revealed a small effect size (d=0.2), with the clothes size goal group having a lower score by 5.2 points compared to the weight loss goal group.

For the CARSAL, analysis showed there was a difference in scores over the five years, F(6, 31)=7.3, p<0.001, but no difference was observed between the weight and clothes goal groups, F(6, 31)=1.1, p=0.39. Calculation of the effect size of the mean difference in CARSAL scores between pre-LAGB and five years post-LAGB revealed a very large effect size (d=1.4), with a difference in CARSAL scores of 15.3

Table 1. Mean ± standard deviation for all weight related measures

Measure	Goal	Pre-LAGB	6 months post	1 year post	2 years post	3 years post	4 years post	5 years post
Weight	Weight loss	144.3 ± 18.3	129.0 ± 16.8	117.1 ± 18.6	114.2 ± 20.4	110.0 ± 21.2	120.4 ± 21.9	119.7 ± 23.0
	Clothes size	146.0 ± 33.6	129.7 ± 22.0	118.5 ± 25.1	118.6 ± 26.0	119.4 ± 24.6	117.9 ± 24.9	116.8 ± 23.2
BMI	Weight loss	51.1 ± 6.6	45.4 ± 5.9	43.1 ± 5.71	39.8 ± 6.6	40.2 ± 7.04	41.8 ± 7.1	41.8 ± 8.2
	Clothes size	53.5 ± 12.7	47.6 ± 8.6	44.9 ± 9.5	43.4 ± 10.0	43.7 ± 9.4	43.5 ± 10.6	41.2 ± 10.5
%EBWL	Weight loss	–	16.3 ± 7.6	30.6 ± 12.5	41.5 ± 20.0	40.8 ± 22.2	33.3 ± 20.8	33.7 ± 26.7
	Clothes size	–	16.3 ± 14.6	31.4 ± 14.1	35.7 ± 18.7	33.6 ± 18.2	35.7 ± 19.0	37.0 ± 15.6

BMI = Body Mass Index; %EBWL = Percentage Excess Body Weight Lost

Table 2. Mean ± standard deviation for all psychometric measures

Measure	Goal	Pre-LAGB	6 months post	1 year post	2 years post	3 years post	4 years post	5 years post
CARVAL	Weight loss	30.4 ± 6.0	27.6 ± 7.4	26.1 ± 7.1	25.3 ± 7.4	24.7 ± 7.7	24.8 ± 9.4	41.9 ± 25.7
	Clothes size	33.1 ± 4.0	28.8 ± 4.7	28.1 ± 5.7	27.1 ± 5.9	25.7 ± 7.4	25.7 ± 9.4	36.7 ± 18.0
CARSAL	Weight loss	34.5 ± 7.1	32.5 ± 7.9	31.7 ± 9.6	32.0 ± 7.5	32.0 ± 7.1	30.2 ± 10.0	19.6 ± 14.1
	Clothes size	37.3 ± 3.5	34.0 ± 4.7	33.9 ± 5.7	35.3 ± 5.1	33.1 ± 4.9	34.1 ± 5.4	21.1 ± 16.4
DAS-24	Weight loss	62.6 ± 18.4	56.7 ± 18.0	54.8 ± 17.6	50.3 ± 17.1	51.0 ± 18.5	50.6 ± 18.9	51.2 ± 20.1
	Clothes size	66.8 ± 11.4	59.6 ± 11.2	57.6 ± 13.3	55.2 ± 17.1	53.6 ± 17.2	53.8 ± 16.6	54.7 ± 16.5

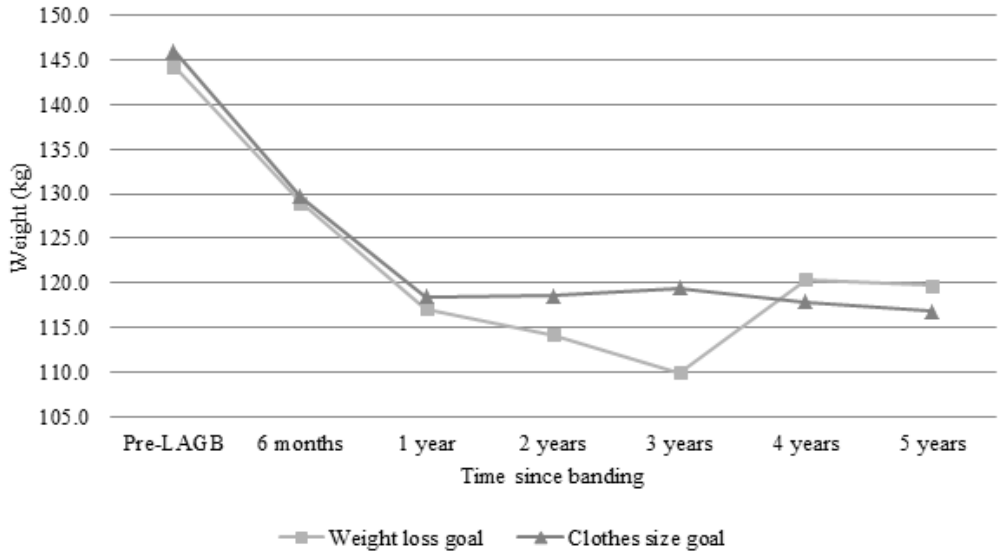

Figure 1. Weight loss over five years by goal set group.

in the sample during this timeframe. Exploration of the effect size of the mean difference in CARSAL scores between the two goal groups at five years post-LAGB revealed a very small effect size (d=0.1), with the weight loss goal group having a lower score by 1.5 points compared to the clothes size goal group.

For the DAS-24, analysis showed there was a difference in scores over the five years, $F(6, 31)=5.5$, $p=0.001$, but no difference was observed between the weight and clothes goal groups, $F(6, 31)=0.3$, $p=0.92$. Calculation of the effect size of the mean difference in DAS-24 scores between pre-LAGB and five years post-LAGB revealed a very large effect size (d=1.5), with a difference of 32.5 in the scores on the DAS-24 in the sample during this timeframe. Exploration of the effect size of the mean difference in DAS-24 scores between the two goal groups at five years post-LAGB revealed an effect size approaching small (d=0.19), with the weight goal group having a lower score by 3.5 points compared to the clothes size goal group.

Discussion

As far as the authors are aware, this is the first time the impact of pre-LAGB goal on long-term weight loss and self-reported views concerning appearance following surgery has been explored. Results indicated that from pre-surgery to five years post-LAGB surgery significant differences in the sample were found in both the objective measures of weight, and the subjective measures of appearance. However, no differences were present between the two goal groups suggesting an individual's personal choice of goal may be the important factor in the goal's success rather than the type of goal per se.

Weight changes

In the sample the three measures of weight changes over the five-year period were positive, showing a reduction as would be typically expected from individuals undergoing LAGB [2]. As would be expected from this type of bariatric surgery the most rapid weight loss in both goal groups occurred in the first year following LAGB [51]. In this sample the pattern of weight changes differed between the two goal groups from one-year post surgery, with the weight loss goal group appearing to lose weight more rapidly than the clothes size goal group until three years post-surgery and then started to gain. Whereas although the clothes size goal groups' weight loss was not as rapid after their first year living with a LAGB, by five years post-surgery they weighed less than the goals group although this difference was not statistically significant. Of interest is that at baseline the weight data was similar in the two goal groups, yet the BMI and %EBWL differences five years post-surgery were greater in the clothes goal group. These data suggest that for individuals who have a clothes size goal, achieving and maintaining this goal may be more manageable than achieving and maintaining a weight loss goal. Individual's whose goal is a clothes size may be able to evaluate and manage their weight changes through fit of clothing and being able to purchase these clothes in high street outlets rather than specialist stores [38], rather than a reliance on using weight alone as a measure of success. This is important, as it has been recognised that weight and BMI measures may not be good indicators of obesity as they do not account for body composition [52], therefore individuals who focus on weight alone as their personal measure of success may struggle more to achieve and subsequently sustain their (possibly) unrealistic goal [10,11].

The wider literature regarding weight loss maintenance suggests losing weight is not the difficult part, but the maintenance is [1,53]. Despite some weight regain in the weight loss goal group in the five-year period, overall in this sample both goal groups successfully maintained over 30% of EBWL five years after having a LAGB, which is likely to have significant health benefits [15]. However, it also should be noted that in terms of obesity classification based on BMI, this sample would still be viewed as morbidly obese five years post-surgery [2]. Nevertheless, the significant and sustained weight loss in the sample supports the use of LAGB for individuals who require surgical intervention to complement behavioural modifications. Furthermore, comparing the sustained %EBWL in this sample to other longitudinal studies suggests this trend is likely to be long-lasting [54].

Appearance changes

In the sample the three measures of appearance over the five-year period showed mixed results. It could be argued that one would assume that as weight, and therefore an individual's physical size reduces, self-perceptions of appearance would become more positive as an individual is seemingly becoming 'normal' [10]. Scores from the DAS-

24 scale decreased over the five-year period, which indicates that as time since LAGB surgery increases individuals do face less problems with appearance in relation to social anxiety and avoidance. In the DAS-24 scale development it was found that older individuals tended to have better adjustment to appearance problems [44], individuals in this sample were all aged over 30 years old which is commonly viewed as the stage in the lifespan where individuals start to become more contented with themselves [55]. Therefore, the reduction in DAS-24 scores found in this study although positive may be linked to a natural part of the ageing process in relation to the view of oneself [56-58], similarly it may be linked to the reduction in weight/BMI which has been found to positively impact on perceptions of body image [59], and therefore potentially associated with less stigma from others - a commonly cited problem in overweight individuals given their visible differences [27,60].

A different pattern was present for the CARVAL and CARSAL scales. Ideally using these scales longitudinally, we would wish to see an increase in the CARSAL score, and a decrease in CARVAL score. However, in this sample over the five-year period the scores on the CARSAL decreased, indicating individuals progressively thought about their appearance more negatively as time since LAGB increased. Similarly, scores on the CARVAL had increased by five years post-LAGB surgery, which indicates individuals held a more negative emotional evaluation of themselves in relation to appearance. The results from the CARVAL scale suggest that from pre-LAGB to four years post scores do decline indicating increasing positive emotional evaluation of themselves in relation to appearance, but by five years these evaluations are more negative than pre-LAGB, particularly in the weight loss goal group sample. There are number of potential explanations for these findings. Although not measured in the current study, it is possible that expectations individuals may have held of future changes in appearance following LAGB surgery may not have been met resulting in these more negative evaluations. Similarly, a common and often difficult side effect of bariatric surgery, both physically and emotionally is excess skin [35,61,62]. The more negative views concerning self-evaluation of appearance found in both goal groups could be linked to the successful weight loss resulting in excess skin. In addition, unrealistic expectations of bariatric surgery are common (e.g., 11), and individuals in both goal groups may have expectations in relation to their goal which may have been unachievable impacting on the less positive perceptions about their appearance five years after LAGB surgery [63]. Despite the clinically significant weight loss, which would have resulted in a changed physically appearance, as previously noted, these individuals would still be classed as morbidly obese using BMI classification, making it challenging for them to view their appearance positively after a substantial number of years living with a LAGB [64].

Individuals face a plethora of challenges following LAGB surgery to comply with their new lifestyle in order to achieve desired results [65]. These findings indicate that following LAGB surgery there may be a need to explore expectations from LAGB with individuals pre-operatively to review ideal body weight/size goals, and re-work with an individual any potentially unworkable goals. Long-term this is likely to help with weight loss and maintenance, but more importantly assist individuals with adjusting to living in a body that is acceptable to them rather than striving for an unachievable perfection [23]. People frequently hope that no longer being visibly different to others will reduce the social stigma they face [37], however for individuals who undergo LAGB surgery changing appearance to become 'normal' takes a significant period of time, which can be psychologically challenging.

Study strengths and limitations

This study maximised data collected as part of a longitudinal study exploring the impact of having a LAGB to explore a previously unexplored topic in relation to setting a specific goal following surgery and exploring outcomes using objective and subjective measures. Differences between and within groups over a five-year period were explored which as far as the authors are aware has not previously been done. This study also demonstrates the importance of exploring psychological as well as weight outcomes following bariatric surgery, as although weight loss may be successful and sustained the psychological impact may not be as positive as envisaged by either the individual having surgery or their clinical team [35,66].

As in other longitudinal studies, there was a need to apply the LOCF method to deal with missing data from participants who failed to complete a psychometric measure at a given time point [47]. It also must be noted that the small sample was drawn from one centre in the South West of the United Kingdom (UK), and were predominantly of White ethnicity. Furthermore, all individuals were required to fulfil the strict criteria to be eligible for LAGB surgery on the UK National Health Service (NHS) [3], therefore findings from this sample may not be widely generalizable. Lastly, the goal group an individual was assigned to for analysis purposes was based on those discussed during pre-LAGB interviews; these were not formally recorded or explored again during the course of the study. Therefore, these may have changed over the five-year period, and future studies would benefit on using a validated measure such as the goal attainment scale [67], to longitudinally explore goals and outcomes following LAGB and other types of bariatric surgery being more commonly performing since this study commenced [68].

Conclusion

The LAGB is a tool to assist with weight loss; personal effort and behavioural changes are still required to successfully lose and maintain it [5-7]. Findings from this study suggest an individual's goal following LAGB surgery (e.g., weight loss or clothes size) are both are as likely to achieve weight loss long-term. The long-term goal an individual set for their future following LAGB-surgery can be a personal choice that clinicians should be aware of in order to work with them to help achieve it.

Declarations

Authorship and contributions

All authors have contributed to the writing of the manuscript.

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Competing interests

The authors declare no conflict of interest.

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