Do more specific plans help you lose weight? Examining the relationship between plan specificity, weight loss goals and plan content in the context of a weight management programme

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What is already known on this subject?

- More specific plans are associated with increased performance of health-related behaviours
- More motivated individuals form more specific plans
- The interrelationship between plan specificity, plan content and behaviour-related goals in relation intervention effectiveness has not been explored to date

What does this study add?

- The effectiveness of forming specific plans may depend on the strength of behaviour-related goals as well as the behaviour selected for change
- More detailed plans, in particular dietary plans, were related to greater weight loss, but only for participants with higher initial weight loss goals
- Detailed exercise plans were not associated with weight loss, regardless of initial weight loss goals

ABSTRACT

Objectives: The conditions under which planning for behaviour change is most effective are not fully understood. In the context of a weight management intervention, we examined the interrelationship between plan specificity, type of behaviour planned (diet vs. exercise) and weight loss goals.

Design: Prospective design and content analysis of plans formed by participants of a 10-week weight management programme.

Methods: Participants (n=239) formulated two plans, for dietary and exercise behaviours respectively. Plans were rated for specificity by examining the number of plan components. Weight loss goals were assessed by asking how much weight participants intend to lose. Weight was measured objectively each of the 10 weeks. Changes in BMI over time and the interactions between plan specificity, and weight loss goals, for all plans and separately for diet and exercise, were estimated using linear mixed models.

Results: Plan specificity was unrelated to weight loss, but interacted with weight loss goals in predicting linear change in BMI (t= -2.48): More specific plans were associated with higher decreases in weight in participants with high weight loss goals. Separate interaction tests for plans formulated for diet and exercise change showed that more specific dietary plans, but not exercise ones, were associated with higher decreases in weight in participants with high weight loss goals (t= -2.21).

Conclusions: Within a population that is highly motivated to lose weight, the combination of high weight loss goals and formulating detailed plans for changing dietary behaviours may be most effective in supporting weight loss.

Keywords: Planning, action plan, implementation intentions, plan specificity, weight management, obesity

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INTRODUCTION

Obesity

The rising levels of overweight and obesity are one of the greatest global public health threats (Ng et al., 2014). In 2014, 39% of adults worldwide were estimated to be overweight and an additional 13% obese (WHO, 2015). In Israel, for example, more than half of the population are classed as either overweight (35.4%) or obese (15.4%) (Israel Center for Disease Control, 2012). Carrying excess weight is linked to an increased risk for a myriad of adverse health conditions such as coronary heart disease, type 2 diabetes and several cancers, and consequently increases risk of mortality (Haslam & James, 2005; Masters et al., 2013).

Behavioural treatment for obesity

Obesity treatment through behaviour change can lead to reductions in weight and improvements in health (Avenell et al., 2004), even in individuals who already experience additional obesity-related risk factors (Dombrowski, Avenell, & Sniehotta, 2010). Modest changes in weight (≥5-10% body weight) are linked to clinically significant improvements in health (Wing et al., 2011), especially when maintained in the long-term (Penn et al., 2013). Effective and scalable weight management interventions, that target both diet and exercise, are needed. These interventions tend to be more effective when they include specific behaviour change techniques, as opposed to merely providing a dietary or activity regimen (Pinto, Gokee-LaRose, & Wing, 2007).

Behavioural treatment for obesity and planning

Behaviour change interventions for weight loss are multifaceted and usually include a variety of techniques (Dombrowski, Sniehotta, et al., 2010). Planning is one specific technique recommended in guidelines for behaviour change (NICE, 2014a) and weight

management (NICE, 2014b). Forming a plan to change behaviour consists of different elements, such as specifying a change target, often a behaviour ('what'), a time ('when'), a place ('where') and elaborations on performance ('how'). A common differentiation in planning techniques is the specification of an action, called action planning (Schwarzer, 2001), and the anticipated response to action-relevant barriers and ways of overcoming these, called coping planning (Sniehotta, Schwarzer, Scholz, & Schüz, 2005). Furthermore, a specific form of planning are implementation intentions (Gollwitzer, 1999), which are "If-Then" plans that explicitly link an anticipated situation (i.e. 'when', 'where') to a goal-directed desired response (i.e. 'what', 'how'). Systematic reviews have generally supported the effectiveness of planning techniques for behaviour change (Gollwitzer & Sheeran, 2006; Kwasnicka, Presseau, White, & Sniehotta, 2013), including obesity-related behaviours (Adriaanse, Vinkers, De Ridder, Hox, & De Wit, 2011; Bélanger-Gravel, Godin, & Amireault, 2013). Adding planning to existing weight management interventions increased effectiveness in several studies (Armitage, Norman, Noor, Alganem, & Arden, 2014; Luszczynska, Sobczyk, & Abraham, 2007). However, these 'booster effects' of added planning were not universal (Benyamini et al., 2013; De Vet, Oenema, Sheeran, & Brug, 2009) and research needs to examine the conditions under which planning affects behaviour and behaviour-related outcomes (Hagger & Luszczynska, 2014).

Moderators of planning-based interventions

Understand when planning is effective is particularly important for non-laboratory based studies, which inform scalable population approaches to behaviour change. Planning interventions in real-life settings are conducted under less controlled conditions and several sources of variation might influence effectiveness. To allow the generation of individually relevant plans, field-based interventions typically provide participants with instructions to plan and a template to fill in specific planning elements (e.g. 'what', 'when', 'where', or

‘how’), but leave the specification and content of plans to participants. Self-generated planning is relevant for interventions where the outcome (e.g. weight loss) can be achieved through different behaviours that vary by participant preference (e.g. increasing exercise or changing dietary intake). However, self-generated planning may lead to variation in the specificity and content of plans, which may in turn influence effectiveness. It has been proposed that more specific and goal-relevant plans increase the likelihood that the behaviour will be performed (Osch, Lechner, Reubsaet, & Vries, 2009). Moreover, the effectiveness of these specific goal-relevant plans might be dependent on the initial size of the goal that individuals hold, with more ambitious goals benefiting more from specific plans.

Specificity and content of planning-based interventions

Several studies examined the link between the specificity and content of self-generated plans and effectiveness. In a physical activity intervention study to prevent weight gain, de Vet et al. (2011) content analysed action plans of the intervention condition that planned ‘what’, ‘when’, ‘where’ and ‘how’ to change (De Vet, Oenema, & Brug, 2011). More specific plans, assessed by the number of components specified, were associated with increased behaviour after 2 weeks and more motivated participants formulated more specific plans. Similarly, van Osch et al. (2010) found that specificity of coping plans predicted smoking abstinence after 7 months in a planning group attempting smoking cessation, and higher motivation was related to more specific plans (van Osch, Lechner, Reubsaet, & de Vries, 2010). Similar findings were obtained in a study that linked specificity of coping plans in general practitioners to health care provision behaviour after 6 weeks, particularly in those with high baseline motivation (Verbiest et al., 2014). Moreover, experimental evidence manipulating plan specificity generally confirms that plan specificity is associated with increased levels of behaviour (Ziegelmann, Lippke, & Schwarzer, 2006).

The present study

To date, no study has examined plan specificity in the context of weight management. Moreover, plan specificity effects have been studied focusing on single behaviour change using short-term outcomes rather than a multiple behaviour change context examining effects on clinical behaviour-related outcomes. This study adds to the evidence-base by examining the effects of the specificity of plans on weight loss, in general *and* in relation to the type of plan (i.e. diet or exercise). Additionally, although motivation has been associated with more specific plans, no study has examined whether motivation and plan specificity interacted in determining behaviour-related health outcomes. We address these gaps by focusing on the interrelationship between plan specificity, type of plan (i.e. diet or exercise), and weight loss goals (as a 'proxy' for motivation) in determining effectiveness.

This article outlines a secondary analysis of a planning condition in a weight management study (Benyamini et al., 2013). Participants received a list of evidence-based lifestyle change techniques for weight management and planned the use of two techniques in detail. The primary analysis of the quasi-experimental study found significantly greater weight loss in the planning condition over the 10-week programme compared to a control condition that was not provided with the techniques. Moreover, the planning condition promoted increased weight loss in individuals who had higher weight loss goals at baseline. In other words, planning was more effective for people who set higher goals. The current study extends this evidence by conducting an in-depth analysis of the content of the plans formulated by participants in the planning condition to see whether more elaborate contents lead to better outcomes. It was hypothesised that:

1. There is a main effect of plan specificity and weight loss: Those who formulate more specific plans display higher weight loss.

2. There is an interaction between formulating specific plans and weight loss goals: Those who have higher weight loss goals benefit more from formulating specific plans by displaying higher weight loss.
3. There is an interaction between formulating specific plans and weight loss goals regardless of the type of behaviour targeted for change in plans i.e., dietary and exercise strategies.

METHODS

Design

Data was obtained as part of a quasi-experimental study using an equivalent time samples design (for details see Benyamini et al., 2013). Briefly, the study included three conditions run sequentially, which were added to a weight loss programme. One intervention condition received a list of evidence-based weight management techniques (details below) alongside an invitation to plan in detail the use of two techniques. The other intervention condition received the same list of techniques and rated planned frequency without forming a detailed plan. A third control condition received no intervention. The planning condition lost 1.10 BMI points on average, the techniques-only condition 1.11 points, and these significantly differed from the control condition who lost 0.79 points. This article examines data from the planning condition only.

Participants and intervention context

Participants were recruited from a weight loss programme run by Maccabi Healthcare Services, the second largest Healthcare Service in Israel, serving about a fourth of the population. This is a group programme, delivered face-to-face by a dietician, within a community venue. It focuses on adopting a healthful diet, healthy eating habits, and regular exercise. Each group includes on average 12 attendees and meets for ten 90-minute weekly

sessions. The programme is actively promoted to customers of the healthcare service with BMI>27. Information is also posted through various channels of the healthcare service and passes by word of mouth. All people who participate in this programme are sufficiently motivated to actively sign up and commit personal time and money.

All programme attendants who presented during recruitment and were able to fill in a questionnaire in Hebrew were eligible to participate; 20% refused. The planning condition, which constitutes the sample for the current study, included 239 participants. Data on the main outcome, BMI, was available for 229 participants.

Planning Intervention

The Research Ethics Committee at the Healthcare Service approved this study (reference number 2005002). The planning intervention was held once, at the second session of each group, and was done individually, in a room where the entire group was working at the same time, each on their own plans. First, the researcher described the study and asked participants to sign an informed consent form and fill in questionnaires, which, for the experimental conditions, included a list of 38 evidence-based weight control techniques adapted from Brownell and Cohen (Brownell & Cohen, 1995). The list consists of lifestyle techniques (e.g., keep healthy foods visible), exercise techniques (e.g., use stairs whenever possible), attitude techniques (e.g., focus on behaviour rather than weight), relationship techniques (e.g., tell your partner how to help), and nutrition techniques (e.g., increase fibre in diet). Participants rated how frequently they intend to use each technique in the coming weeks (from 1='never' to 4='every day'). This took 5-10 minutes.

The dietician then explained the idea of forming a detailed plan and provided an additional form, asking participants to choose two techniques from the provided list, which could be adapted for personal preference (or their own technique), one each for diet and exercise. On the form it read "*Studies show that when we have a goal, we are more likely to*

implement it if we decide in advance when, where, and how to carry out the actions necessary to achieve this goal. From the variety of techniques that you have read, please choose two techniques that you intend to use and specify precisely when, where, and how you will use these techniques.". Participants received an example of a precise plan for exercise. They were asked to list their chosen technique and write in the space provided 'when' ("*When will you carry this out*?"), 'where' ("*Where will you carry this out*?"), and 'how' ("*How will you carry this out*?") they will implement it. Additionally, participants specified which barriers they foresee ("*What obstacles may stand in the way to carrying out this plan*?"), and how to cope with them ("*How will you overcome these obstacles*?"). An example plan is: "*Technique*: eat healthy snacks; *when*: weekdays, when return from work hungry; *where*: at home; *how*: rinse fruit and cut vegetables after dinner, store in fridge for next day; *barriers*: running out of supplies, forgetting to prepare fruit and vegetables; *coping*: prepare template shopping list with fruits and vegetables; put sign on fridge". Participants were encouraged to use the planning form as a prompt/cue in their home environment. A copy of the plan was left with the researchers. This took 25-30 minutes.

The dietician and the researcher were present to answer questions and encouraged participants to fill in detailed plans. Participants who did not complete all parts of the planning form were asked to elaborate their plans. However, the final choice of how to fill the form was theirs and therefore plans varied in their level of specificity.

Measures

Body Mass Index (BMI=kg/m^2) – the dieticians delivering the weight loss programme measured participants' height and weight before the start of the first session. At each weekly session, they recorded weight using the same standard mechanical medical scale.

Participant characteristics and goals – participants reported basic socio-demographics, past participation in weight loss programmes, weight, and weight loss goal

("*How many kilograms do you aspire to lose in this programme*?") (Benyamini & Raz, 2007), which was converted to BMI. Participants received no guidance on how to choose their weight loss goal.

Coding of plans

For the planning task, we coded one sheet per participant, which included plans for two techniques, each with an action and a coping plan. The plans were coded for specificity based on their structural features, following previously outlined procedures (Ziegelmann et al., 2006). Each part of each component of the plan received one point and total scores for plan specificity were calculated by summing these points across the entire plan. One point was assigned for specifying the technique name ('label' component; also coded as diet/exercise/other[1]), and one point each for each aspect of the 'when', 'where' and 'how' components, for each barrier listed and for each strategy to overcome barriers. For example, mentioning the frequency, day of the week, and time of the day when an activity would be carried out resulted in three points for 'when'. The range for the total number of components per plan was 0-13. For example: For sports activities, a participant who wanted to exercise in a gym and planned to go to the gym twice a week with a friend, on Monday and Wednesday, for an hour each time, the plan would be coded as follows: One point for 'exercise', 3 points for 'when' (mentioned frequency, specific days, and time allotted on each day), 1 point for 'where' (gym) and 2 points for 'how' (going to the gym with a friend). If that person mentioned that her babysitter was not always available to stay later on Mondays and that she would ask the neighbour to help with, these would count as two more points for obstacle and way of coping with it. The total score would be 9. Three separate total scores were used: For plans focused on dietary changes, for those focusing on exercise, and for both plans together.

[1] There was full agreement between the coders about the type of plan. Less than 4% were neither exercise nor diet and thus coded 'other' (e.g. weekly weighing or enlisting the support of the spouse or a friend) and added only to the total plan score.

The following steps were taken to ensure reliability and standardization of coding: (1) After deciding to give one point to each aspect of each component, two raters and the principal investigator rated 20 planning sheets and then read them together and discussed any disgreements, which helped fine-tune the coding instructions; (2) Next, two raters independently rated 54 additional planning sheets. Inter-rater agreement for the different components ranged between 50 and 90 percent (kappas between 0.3 and 1). To improve agreement, the two raters and the principal investigator discussed and resolved discrepancies, further fine-tuning the instructions. (3) To check that rating was standardized now, all three consulted on 10 more planning sheets, creating an agreed rating for each plan; (4) After that, the two raters independently rated 100 additional plans. The agreement ranged between 92 and 100 percent (kappas 0.9-1.0). The few remaining disagreements were resolved by discussion between the raters and the principal investigator, after which the raters went on to rate the remainder of the plans. All plans coded initially as part of establishing a shared understanding were coded according to the final agreed coding criteria.

Analyses

The data were analysed with the Linear Mixed Models procedure of the R Software. The outcome variable was the repeated BMI measures, based on dietician-recorded weights at the ten weekly group sessions. Linear and quadratic trend terms described the change in BMI during the course of the programme, with time coded as integer values from 0-9, so that the intercept reflects initial BMI.

Model 1 included baseline covariates entered as fixed effects: Age, sex, education, participation in a past programme, weight loss goal, overall plan specificity and the interaction between weight loss goal and plan specificity. Effects of the covariates on weight loss/gain were reflected by interactions between these terms and those for the linear time trend. In order to control for the effect of initial BMI, interactions between this measure and

the linear and quadratic terms were added. A 3-way interaction of goals, plan specificity and linear change in BMI was added to examine whether the weight loss goal and plan specificity interacted with weight loss/gain. Model 2 included the same effects as in Model 1, with the exception of plan specificity, which was divided into plan specificity for dietary plans and plan specificity for exercise plans. Random effects included between-subject variation in the intercept, the linear and quadratic time trends and, at the within-subject level, the random error around the BMI profile curve. The fixed effects for these factors represent the mean intercept and mean linear and quadratic slopes. The random effects represent the extent to which individuals deviate from these means and therefore the estimate presented is the variance of the parameter across participants.

All available data on weight were used to estimate change in BMI so that participants missing some of the measurements were included in the model. Participants missing data on a covariate were not included in the model (five participants who did not report age and six who did not report education) and 10 additional participants were excluded from the models because of missing data on goals. The 'BMI at entry' covariate was based on the dietician record at week 1. If unavailable, it was supplemented with BMI at week 2 or in the baseline questionnaire. This covariate was centered at 30 (close to the sample mean) for ease of interpretation.

RESULTS

Participants (n=239) were on average 47.1 (SD=11.0) years old (range 18-75), mostly female (90%) and reported 14.6 (SD=2.8) years of education. Most (71%) had participated in a weight loss programme before. The average BMI was 31.21 (SD=5.48). The mean weight loss goal for the 10-week programme was 8.16 kg (SD = 3.73), which is almost 10% of their weight (goal/weight*100 = 9.61±3.83 percent). A third of the participants had a total specificity score of up to 13, the middle tertile's score was 14-16 and the upper tertile 17 and

above. For the diet and the exercise plans separately, the lowest tertile included plans with up to 5 points and the highest one included plans of >7 points for diet and >8 for exercise. There were no significant correlations between weight loss goals and overall number of plan components (r=.014, p=.830) as well as diet (r=-.032, p=.631) and exercise plan components (r=.035, p=.592).

Table 1 presents the multivariate Model 1 of the changes in BMI over the 10-week programme and their predictors. The top part of Table 1 shows the predictors of higher BMI at programme entry. Several factors appeared in Model 1 as predictors of *baseline* BMI (i.e., significantly added to the intercept; model estimated addition in parentheses): age (0.104; t=3.52, p<.0001), education (-0.231; t=-2.09, p<.05), participation in past programmes (1.860; t=2.68, p<.01), and weight loss goal (1.542; t=2.17, p<.05).

The next part of Table 1 shows that BMI followed a significant linear and quadratic trend. Participants showed a significant decline in BMI over the 10 weeks of the programme, which was more rapid at first. Next, interactions of baseline characteristics (including weight loss goal and plan specificity) with the linear change in BMI were added, to test their role as predictors of change in BMI. The only significant main effect that predicted *decline* in BMI during the programme was higher initial BMI (-0.006; t=-2.74, p<.01), which was related to a more rapid linear but not quadratic decline. Plan specificity was in itself unrelated to the decline in BMI. Lastly, the three-way interaction between goal, plan specificity and linear changes in BMI was significant (-0.003; t=-2.49, p<.05). More specific plans were associated with greater baseline weight loss in participants who had set higher weight loss goals, whereas for those who had lower weight loss goals, specific plans were associated with a smaller advantage in terms of weight loss (Figure 1).

Model 2 (presented in Table 2) was similar to the first model, but overall plan specificity was split into two variables, depending on whether the plans targeted a change in

diet or exercise. Similar to Model 1, *baseline* BMI was significantly predicted by older age (0.104 per year; t=3.63, p<.01), education (-0.260 per year; t=-2.41, p<.05), participation in past programs (1.800; t=2.66, p<.01), and weight loss goal (1.460; t=2.37, p<.05), but not plan specificity for diet and exercise or their respective interactions with weight loss goals. The only significant main effect predicting *decline* in BMI during the programme was higher initial BMI (-0.005; t=-2.26, p<.05), which was related only to a more rapid linear, but not quadratic, decline. Plan specificity for diet and exercise were not predictive of BMI change over time. Lastly, the 3-way interaction between goals, linear changes in BMI and plan specificity for diet was significant for the dietary (-0.003; t=-2.22, p<.05), but not exercise plan components (-0.002, t=-1.14, p>.05): More specific dietary plans were associated with greater weight loss in individuals with higher weight loss goals whereas for those with low weight loss goals plan specificity was not associated with weight loss (Figure 2).

To help envisage the findings, analyses were repeated with weight rather than BMI as the outcome and weight loss goals in kilogrammes, as participants specified in the questionnaire. The pattern of results was the same and showed that, for example, a participant with baseline weight of 85kg and a low weight loss goal of 5kg would have lost 0.42kg more when specifying 10 food plan components rather than none. In contrast, a participant with the same weight and a weight loss goal of 15kg would have lost an additional 5.5kg when specifying 10 food plan components, rather than none.

DISCUSSION

Principal findings

This study examined the interrelationship between plan specificity and weight loss goals in the context of a planning intervention, implemented within a 10-week weight management programme. Plan specificity was related to greater weight loss in participants who had a higher initial weight loss goal, which was not the case for those who reported

relatively low weight loss ambitions. Moreover, when examining the content of the plans, the relationship between higher goals, plan specificity, and increased weight loss was significant only for dietary plans, but not for exercise plans. This suggests that formulating specific plans is most effective for weight management in participants who initially set higher weight loss goals and when focusing on dietary behaviour change.

Strengths and weaknesses of the study

This is the first study to examine the relationship between plan specificity and weight loss goals. The primary outcome, BMI, was assessed objectively and continuously throughout the study rather than merely at baseline and follow-up. The study was conducted as part of an ongoing weight management programme, adding external validity to the findings. The main weakness is the correlational nature of the study. As participants were not randomised to different specificity or weight loss goal conditions, causation cannot be inferred. Coding of plan specificity is subjective and was not instantly reliable, but was improved and excellent following adjustments. Weight loss goals were assessed using only a single self-report item, and, although related to the strength of motivation to change behaviour, are not the same as self-reported levels of motivation (Carver & Scheier, 2001). However, participants invested their time and money to participate in the programme, of their own initiative, suggesting a high level of motivation. In this context, weight loss goals may be a good indicator of their commitment to the programme. BMI assessments were not blinded. The study assessed weight as a proxy-measure for behaviour change, actual behaviour was not assessed directly. In addition, the weight control techniques provided to participants for planning might differ in their effectiveness which might have influenced results. Lastly, the majority of participants were female, in line with the typical gender distribution in weight management interventions (Robertson et al., 2014), which limits generalizability of the findings to men.

Relation to other studies

In contrast to previous research (De Vet et al., 2011; van Osch et al., 2010; Verbiest et al., 2014), we did not find that more specific plans are related to better outcomes. However, we provide two additional insights into planning effects. First, the effects of plan specificity are related to effectiveness when participants have high outcome goals. Previous studies tended to provide behavioural goals (e.g., de Vet et al. 2011 asked participants to increase physical activity by two hours per week) and measured motivation in relation to this goal. Our study uses the participants' size of the intended outcome goal as a measure of motivation. We found that this is important in determining whether plan specificity is related to weight loss. Second, the content of plans – diet or exercise – matters in terms of achieving behaviour-related health outcomes, which was dependent on the size of the goal. Previous studies showed a relationship between specificity and behaviour change (De Vet et al., 2011; van Osch et al., 2010; Verbiest et al., 2014), within a single behavioural domain. By focusing on a health outcome (i.e. weight), which can be achieved through changing different types of behaviours (i.e. diet or exercise), we extend these findings, suggesting that plan specificity effects might not only depend on the size of the goal, but also on the behaviour that one selects to change the behaviour-related outcome.

The current findings add to the literature on the relationship between weight loss goals and subsequent outcomes. Although weight management guidelines recommend the setting of realistic weight loss goals (NICE, 2014b), systematic review evidence for this recommendation is either inconclusive (Crawford & Glover, 2012) or reports no relationship between realistic goals and more favourable outcomes (Durant et al., 2013). This study provides evidence on the conditions under which unrealistic weight loss goals might impact weight loss outcomes: higher weight loss goals are related to greater weight loss, but only when people engage in specific planning for dietary behaviour change.

Possible explanations and implications

The lack of association between plan specificity and weight loss is surprising given previous research (De Vet et al., 2011; van Osch et al., 2010; Verbiest et al., 2014). One possible explanation is that for some people detailed plans may backfire. People who are generally motivated but not highly committed may find it difficult to stick to detailed plans and end up more frustrated and less adherent than people who display a high level of commitment.

The interaction between plan specificity and weight loss goals might be explained by the 'intended range of application' of planning-based interventions (Sniehotta, Presseau, & Araujo-Soares, 2015). Planning is a volitional strategy shown to be effective in individuals motivated to change (Sniehotta, 2009). The volitional nature of planning lends itself for use in populations that volunteer for behavioural weight management interventions and our findings further suggest that specific plans are more likely to translate into change for those with higher outcome goals.

The finding that weight loss is related to a combination of weight loss goals and goal specificity only when the content of the formulated plan focuses on changing dietary behaviour can be explained in two ways: First, exercise change usually includes performing additional actions such as walking or going to the gym, which need to be added to one's schedule. Dietary behaviour, however, requires the replacement of a previous, often habitual, behaviour with a new one. Replacing old behaviours with new ones might be more difficult compared to adding new behaviours to the repertoire and requires fighting automatic processes (Sheeran, Gollwitzer, & Bargh, 2013). Specific planning might be most effective for the cognitively demanding task of replacing and forming new habits as it mimics the effects of automatic processes (Gollwitzer, 2014).

Second, evidence suggests that weight loss is more likely to result from dietary as opposed exercise change (Dombrowski, Avenell, et al., 2010). Although exercise plays an important role in weight management, especially in relation to weight loss maintenance (Dombrowski, Knittle, Avenell, Araújo-Soares, & Sniehotta, 2014), it is less effective at inducing weight loss compared to dietary change (Church, Earnest, Skinner, & Blair, 2007; Foster-Schubert et al., 2012). Participants with high weight loss goals and more specific plans might have engaged in more exercise behaviour, but this in turn did not lead to significant changes in weight within the current 10-week timeframe.

Current behaviour change guidelines recommend the use of planning for weight loss (NICE, 2014a) and suggest discussions of realistic weight-loss goals of 5% or more (NICE, 2014b). Based on Model 2, for someone intending to lose 5% of weight during the programme, the additional weight loss when formulating a specific plan to change eating (i.e. specifies 10 food plan components) compared to someone who does not plan would be 0.12kg. In contrast, a participant who intends to lose 15% of their weight and formulates specific plans for changing eating behaviour would lose an additional 5.30kg compared to someone not formulating a plan. The setting of realistic goals as currently recommended might undermine the effectiveness of formulating specific plans for weight loss outcomes.

Unanswered questions and future research

The findings need to be confirmed examining long-term outcomes beyond the initial 10-week period. Exploring the implied causation in the results could be followed up using a full factorial design randomising participants to high and low weight loss goals and plan specificity conditions. Such a design would set aside real-life internal motivation, allowing one to investigate the beneficial effects of high goals (or the harmful effects of low goals) regardless of personal motivation or dispositions that foster it. If simply encouraging high goals does not contribute to weight loss, this may mean that high goals are indeed a reflection

of high motivation to lose weight and are not sufficient in themselves.

This study suggests that the content of plans is important in relation to weight outcomes. Further studies should also examine the behavioural strategies selected for change and its relation to effectiveness. In addition, factorial designs that systematically examine combinations of different plan components might provide further insights into the necessary and sufficient elements of plans. In addition to plan content, future studies could examine the context of planning such as the amount of instructions and encouragement necessary to formulate effective plans.

Finally, the weight loss goals reported by most participants fall short of their achievements and may result in disappointment. Our results imply that it is important to encourage high goals, even if unrealistic. However, caution should be exercised as this could lead to frustration, which could hinder efforts to maintain weight loss over time (Crawford & Glover, 2012). Thus, the focus should not be merely on goals, but rather on ways to persist in dieting, achieve these goals, and gain confidence in one's ability to lose more weight and/or to maintain weight loss achieved so far. The findings support the contribution of planning interventions in this respect. Future studies could also test whether further adapting detailed plans after the initial weight loss period, so that they are focused on maintenance over time, is productive both in maintaining weight loss and in preventing possible harmful effects of any disappointment from the gap between goals and achievements.

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Table 1. Linear mixed models of the changes in BMI and their predictors including overall plan specificity over the 10-week group programme. Negative estimates indicate decrease in BMI.

	Model 1		
	Weight loss goal and overall plan specificity		
Fixed effects	**Estimate**	**Std. Error**	**t value**
(Intercept)	23.302	3.271	7.12***
Age	0.104	0.030	3.52***
Male Gender	0.773	1.023	0.76
Education	-0.231	0.110	-2.09*
Past programme	1.860	0.693	2.68**
Weight loss goal	1.542	0.709	2.17*
Plan specificity	-0.004	0.149	-0.02
Weight loss goal x Plan specificity	0.008	0.045	0.17
Time – linear change in BMI	-0.261	0.089	-2.93**
Time – quadratic change in BMI	0.012	0.001	12.10***
Interactions with linear change in BMI:			
BMI at programme entry	-0.006	0.002	-2.74**
Age	0.001	0.001	1.57
Gender	-0.007	0.027	-0.26
Education	-0.002	0.003	-0.85
Past programme	0.019	0.018	1.06
Weight loss goal	0.012	0.021	0.58
Plan specificity	0.008	0.004	1.80
Quadratic change in BMI X BMI at entry	0.000	0.000	1.35
3-way interaction			
Goal X linear changes in BMI X Plan	0.003	0.001	-2.49*

specificity		

Random effects	**Variance**	**SD**
(intercept)	19.076	4.368
Time – linear change in BMI	0.009	0.096
Time – quadratic change in BMI	0.000	0.003
Residual	0.050	0.223

Number of participants/BMI observations: Model 1: 212/1458; **p* < .05, ***p* < .01, ****p* < .0001.

Table 2. Linear mixed models of the changes in BMI and their predictors including diet and exercise plan specificity over the 10-week group programme. Negative estimates indicate decrease in BMI.

	Model 2		
	Weight loss goal and diet and exercise plan specificity		
Fixed effects	**Estimate**	**Std. Error**	**t value**
(Intercept)	23.352	3.019	7.74***
Age	0.104	0.029	3.63**
Male Gender	0.466	1.006	0.46
Education	-0.260	0.108	-2.41*
Past programme	1.800	0.678	2.66**
Weight loss goal	1.460	0.617	2.37*
Plan specificity (diet)	0.170	0.185	0.92
Plan specificity (exercise)	-0.122	0.199	-0.61
Weight loss goal x Plan specificity (diet)	0.028	0.052	0.54
Weight loss goal x Plan specificity (exercise)	0.010	0.064	0.15
Time – linear change in BMI	-0.218	0.083	-2.64**
Time – quadratic change in BMI	0.012	0.001	12.12***
Interactions with linear change in BMI:			
BMI at program entry	-0.005	0.002	-2.26*
Age	0.001	0.001	1.62
Gender	-0.001	0.027	-0.04
Education	0.002	0.003	-0.57
Past program	0.019	0.018	1.03
Weight loss goal	-0.004	0.018	-0.21
Plan specificity (diet)	0.004	0.005	0.80

Plan specificity (exercise)	0.005	0.005	0.90
Quadratic change in BMI X BMI at entry	0.000	0.000	1.33
3-way interactions			
Goal X linear changes in BMI X Plan specificity (diet)	-0.003	0.001	-2.22*
Goal X linear changes in BMI X Plan specificity (exercise)	-0.002	0.002	-1.14

Random effects	**Variance**	**SD**
(intercept)	18.203	4.266
Time – linear change in BMI	0.009	0.096
Time – quadratic change in BMI	0.000	0.003
Residual	0.050	0.223

Number of participants/BMI observations: Model 2: 212/1458; *$p < .05$, **$p < .01$, ***$p < .0001$.

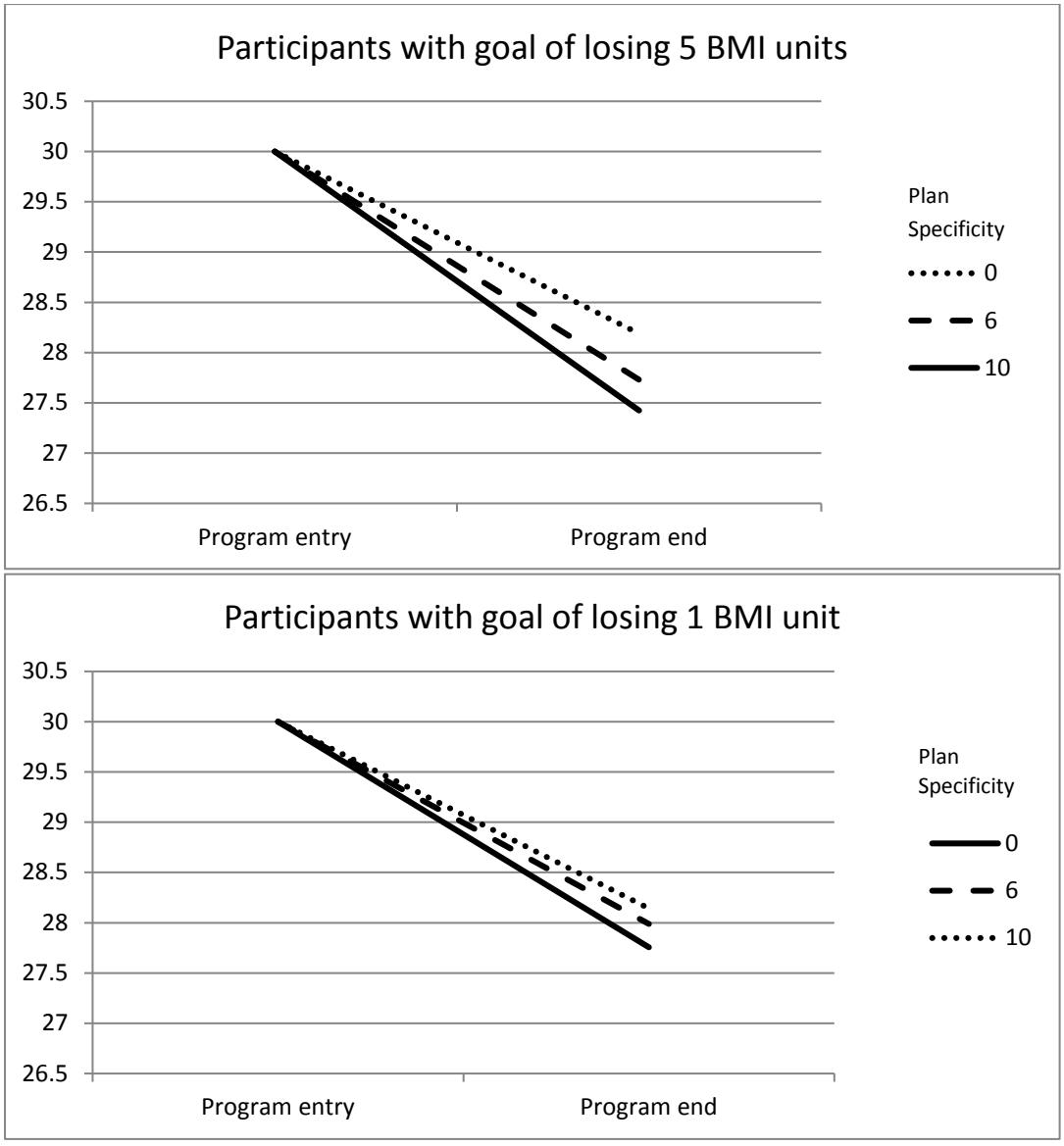

Figure 1: Change in BMI from a typical participant (BMI=30 at programme entry) from beginning to end of the programme depending on size of weight loss goal (1 vs. 5 BMI units) and specificity of the overall plans (categorised as 0, 6, and 10 plan components which are approximately at percentiles 10, 50 and 90).

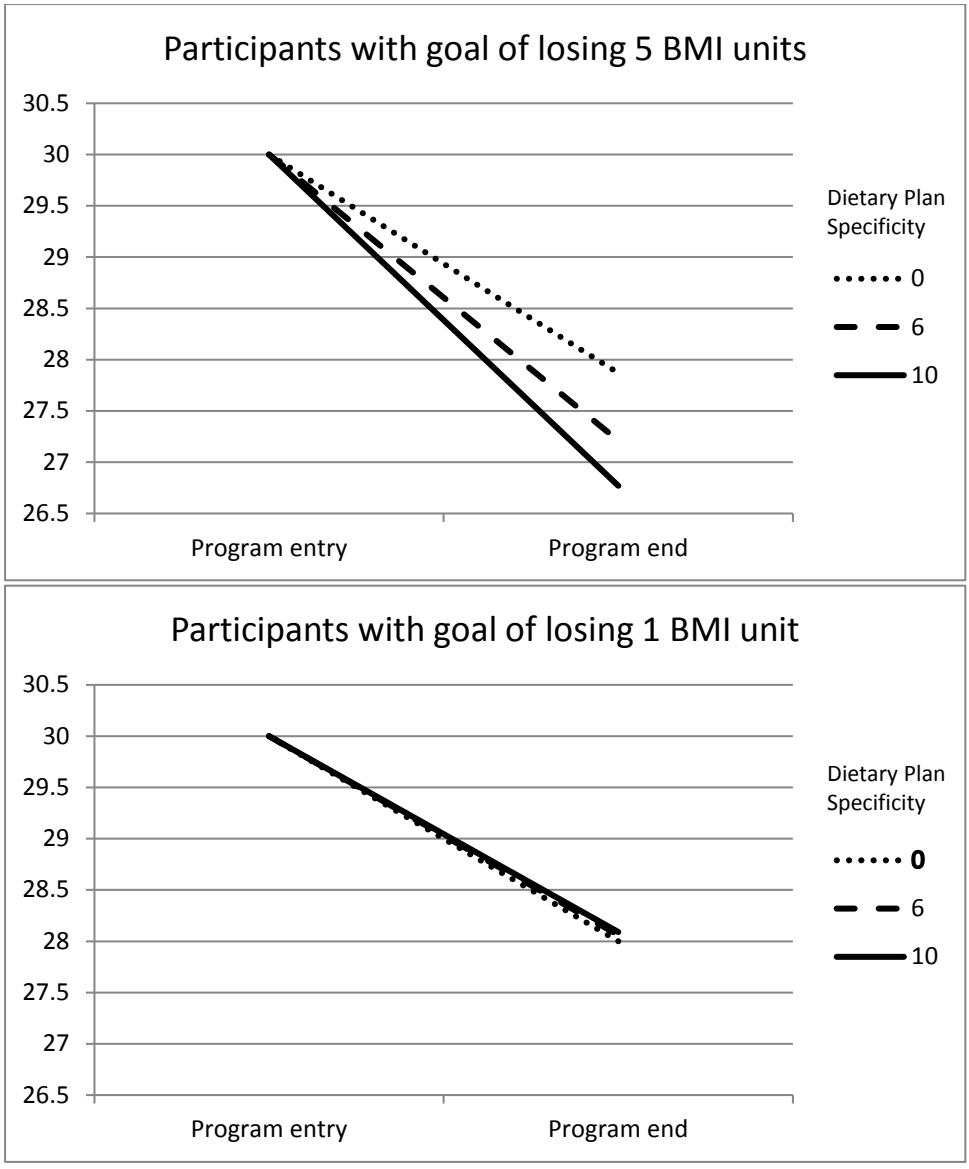

Figure 2: Change in BMI from a typical participant (BMI=30 at programme entry) from beginning to end of the programme depending on size of weight loss goal (1 vs. 5 BMI units) and specificity of the dietary plans (categorised as 0, 6, and 10 plan components which are approximately at percentiles 10, 50 and 90).

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