

**Cognitive and behavioural strategies employed to overcome “lapses” and prevent “relapse” among weight-loss maintainers and regainers: a qualitative study**

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## **Cognitive and behavioural strategies employed to overcome “lapses” and prevent “relapse” among weight-loss maintainers and regainers: a qualitative study**

### **WHAT IS ALREADY KNOWN ABOUT THIS SUBJECT**

- Behavioural weight-management programmes are effective in the short-term, but weight regain is common
- Dealing with lapses and preventing relapse is a particular threat during the weight loss maintenance phase
- Identifying strategies that support successful long term weight maintenance could inform better treatment but is an under-researched area.

### **WHAT THIS STUDY ADDS**

- Maintainers employed self-regulation techniques, anticipated potential lapses and made plans to compensate for these although few engaged in regular self-weighing.
- Regainers made some efforts to self-regulate their behaviour, but they did not tend to make plans, used relaxed dietary monitoring, found distraction strategies ineffective and struggled with navigating interpersonal relationships in relation to food.
- Monitoring, planning and managing interpersonal relationships appeared to be crucial strategies for overcoming ‘lapses’ and preventing ‘relapse’ after participating in a weight management programme and should be incorporated in future programmes.

## ABSTRACT

While many behavioural weight management programmes are effective in the short-term, post-programme weight regain is common. Overcoming “lapses” and preventing “relapse” has been highlighted as important in weight-loss maintenance, but little is known on how this is achieved. This study aimed to compare the cognitive and behavioural strategies employed to overcome “lapses” and prevent “relapse” by people who had regained weight or maintained weight-loss after participating in a weight management programme. By investigating differences between groups, we intended to identify strategies associated with better weight-loss maintenance. Semi-structured interviews were conducted with 26 participants (58% female) recruited from the 5-year follow-up of the WRAP trial (evaluation of a commercial weight-loss programme). Participants who had lost  $\geq 5\%$  baseline weight during the active intervention were purposively sampled according to 5-year weight trajectories (n=16 “Regainers”, n=10 “Maintainers”). Interviews were audio-recorded, transcribed verbatim, and analysed thematically. Key differences in strategies were that Maintainers continued to pay attention to their dietary intake, anticipated and planned for potential lapses in high-risk situations, and managed impulses using distraction techniques. Regainers did not report making plans, used relaxed dietary monitoring, found distraction techniques to be ineffective and appeared to have difficulty navigating food within interpersonal relationships. This study is one of the longest qualitative follow-ups of a weight loss trial to date, offering unique insights into long-term maintenance. Future programmes should emphasise strategies focusing on self-monitoring, planning and managing interpersonal relationships to help participants successfully maintain weight-loss in the longer-term.

**Abbreviations:**

WRAP: Weight Referral: Weight Loss Referrals for Adults in Primary Care; RCT: randomised controlled trial; PA: physical activity; PPI: Patient and Public Involvement

**INTRODUCTION**

Behavioural weight-management programmes for the treatment of obesity have been found to be effective in the short-term, but weight regain is common.<sup>1-5</sup> In the context of an obesogenic environment,<sup>6</sup> individuals are subjected to an array of internal and external pressures that challenge the continuation of weight-management behaviours. Pressures, including changing personal circumstances and unsupportive social contacts, can lead to lapses in adherence to intended behaviours.<sup>7-9</sup> Dealing with lapses and preventing relapse is a particular threat during the maintenance phase, as accountability and reinforcement is minimal after completion of a programme. Individuals may also be less motivated to continue with challenging healthy behaviours when they are maintaining, rather than losing weight.<sup>10</sup> However, many people can and do maintain weight-losses,<sup>11,12</sup> although little is known on how they achieve this and which cognitive and behavioural strategies are implemented and maintained in the longer-term.<sup>13</sup>

Recently, attention has been paid to theoretical explanations for behaviour change maintenance to help understand this phenomenon. Kwasnicka et al's<sup>14</sup> review and synthesis of theoretical explanations for behaviour change maintenance found that main themes focused on the differential nature and role of maintenance motives, self-regulation, habits, resources (psychological and physical) and the influence of environmental and social factors. Further, in a synthesis of qualitative studies on

weight loss maintenance, Greaves and colleagues<sup>7</sup> created a 'conceptual model' in which they proposed that weight-loss maintenance generates psychological 'tension'. This is from the necessity to override existing habits and incompatibility of the behaviours needed to maintain weight with psychological needs. The authors suggested that to successfully achieve maintenance and avoid lapses or relapse, this tension needs to be managed or resolved. Importantly, authors found variation in the strategies employed by individuals successful or unsuccessful in weight-loss maintenance when attempting this. For example, Maintainers made use of self-regulation strategies and managing external influences, which were not as evident among Regainers. This is suggestive that implementation of certain cognitive and behavioural strategies may be key to successful weight maintenance.

The review by Greaves et al.<sup>7</sup> highlighted research gaps and limitations of previous qualitative research in the area. Importantly, only a limited number of studies attempted to compare strategies used by people with different weight trajectories.<sup>15,16,25,17-24</sup> Such a comparison is key to identifying and unpicking strategies associated with better weight-loss maintenance to inform future programmes. Most studies relied on self-reported weight history to categorise participants rather than objective measures, comprising the robustness of their findings. These studies also often focused on a population sub-group (e.g. post-partum women<sup>17</sup>), had samples with a high proportion (or exclusively) females<sup>15-18,20,23,24</sup> and were skewed towards higher socio-economic groups.<sup>15,18,20,23,24</sup> As a result, weight management interventions based on these findings may not meet the needs of the general population and could widen health inequalities.

A major weakness of previous qualitative studies has been the short-term follow-up; participants have typically been managing their weight for less than 12 months, therefore little is known about strategies employed for long-term weight management. Indeed, many participants were likely to be still aiming for weight-loss rather than maintenance, and may have limited experience of lapses and relapse. Evidence suggests that implementation of strategies and challenges in weight management change over time.<sup>26-28</sup> For example, in a recent study, Pedersen et al.<sup>27</sup> explored whether self-regulation of food intake differed between short and long-term weight loss maintainers, finding key differences around planning, shopping/storing and preparing/cooking behaviours. However, this study also defined long-term as >12 months, and used self-reported history to categorise participants' weight trajectories.

To address the limitations of previous research, we have conducted one of the longest qualitative follow-ups of a behavioural weight management programme to date. Further, we have used multiple objective weight measurements to categorise participants by their weight trajectories. Our study aimed to compare the cognitive and behavioural strategies employed to overcome "lapses" and prevent "relapse" by people who had regained or maintained weight-loss five years after participating in a weight management programme. By comparing groups, we aimed to identify strategies associated with better long-term weight-loss maintenance in order to inform the development or refinement of future weight management programmes.

## **MATERIALS AND METHODS**

### **Sampling and participants**

This qualitative study was embedded within the 5-year follow-up of the Weight Loss Referrals for Adults in Primary Care (WRAP) randomised controlled trial (RCT).<sup>29,30</sup> Detailed information on intervention and control content can be found in previously published articles.<sup>29,30</sup> In brief, the trial recruited adults with a BMI over 28kg/m<sup>2</sup> and randomised them to either: referral to a commercial open-group behavioural weight-management programme (WW, formerly Weight Watchers) for 12 weeks; referral to the same programme for 52 weeks; or the control group. The WW intervention consisted of weekly in-person group meetings, including a weigh-in and a 30-minute interactive education session led by the coach. The education sessions provided advice on diet, physical activity (PA), positive mind-set, using behavioural strategies (e.g. goal-setting, self-monitoring, problem-solving, modifying the personal food environment, and relapse prevention), and facilitated peer support from coaches and other group members. Participants also received access to WW online tools for the duration of the intervention. The control intervention was a standardised brief intervention: recognition of the problem by the general practitioner (letter of invitation), basic written information on self-help weight loss strategies provided by a member of the research team at baseline and weighing at follow up time points.

Twenty six participants were purposively sampled from the 12 and 52 week behavioural weight-management programme arms, using trial data on weight trajectories (weight was objectively measured at 0, 3, 12, 24 and 60 months) and demographic variables to gain a diverse sample. Participants from the 12 and 52 week intervention arms were interviewed as we were specifically interested in the

experiences of weight management after losing weight as part of a behavioural weight management programme. We selected participants who had lost  $\geq 5\%$  baseline weight during the first 12 months of the trial, to ensure that they had experience of weight loss and of trying to maintain this loss. We aimed for variation in gender, age, education and income. To facilitate this, we recruited participants from the Cambridge (n=15) and Liverpool (n=11) centres of the trial.

Using objectively measured data from their 5-year follow up from baseline, participants were categorised into those who had maintained their weight-loss ( $\pm 3\text{kg}$ ) or lost more weight (n=10; Maintainers) since the end of the WRAP study intervention, and those who had regained  $>3\text{kg}$  of weight since the end of the WRAP study intervention (n=16; Regainers) (end of intervention was either 12 or 52 weeks from baseline, dependant on group allocation). During this time period, participants did not attend the weight management programme offered in the study, unless they decided to continue of their own volition at their own financial cost.

Baseline weight for Maintainers ranged from 65.9 to 159.9 kg, with a mean of 103.6kg (SD 26.6), and Regainers ranged from 77.1kg to 110.5kg, with a mean of 94.9kg (SD 11.9). From the end of the intervention to time of interview, Maintainers had lost 4.1% of their body weight (-3.9kg) and Regainers had gained 11.3% (+9.8kg) (Tables 1 and 2).

### **Interview schedule**

The interview schedule was developed through reviewing relevant literature<sup>7</sup> and consulting with experts (a specialist bariatric general practitioner, academics specialising in behaviour change research from psychology, sociology and medical

backgrounds). It was reviewed by members of a specialist multidisciplinary weight management programme to ensure coverage of important topics and appropriate language. Questions focused on key personal, social and environmental challenges to weight-loss maintenance and strategies used in managing lapses and relapse. The semi-structured schedule ensured that key topics were addressed in all interviews and allowed for further probing and discussion to be guided by participant responses. The schedule was piloted and revised after three interviews (these interviews were included in the main analysis).

### **Data collection**

Ethical approval was gained on 28<sup>th</sup> November 2017 from the West Midlands - Coventry and Warwickshire Research Ethics Committee (Application number: 17/WM/0432), and has abided by the Declaration of Helsinki. Participants were initially contacted via letter to introduce the study, invite participation and provide an information sheet. Those who responded positively to the invitation were telephoned to arrange an appointment for interview. Non-responders were followed up with a reminder telephone call. All participants approached agreed to be interviewed.

The lead author (ERL) conducted individual face-to-face interviews with participants using a semi-structured interview schedule. Participants had previously participated in the WRAP study, but had not had any previous contact with ERL. Participants were given a choice of location for the interviews, either within their homes or in a private room at the University of Cambridge or the University of Liverpool. Only the researcher and the participant were present for all except two interviews, where the participant's spouse was also present. Participants provided written consent to

participate and for their interview to be digitally audio-recorded. Interviews were then transcribed verbatim. Each interview was anonymised by implementation of a number coding system prior to transcription. Interviews were conducted between May to September 2018, with interviews lasting between 25 and 87 minutes (mean of 53 minutes).

### **Data analysis**

Verbatim transcripts were analysed using a thematic approach to provide a detailed and data driven account of participant's experiences<sup>31</sup>. Given the limited knowledge of experiences of weight maintenance beyond 12 months, the aim of the current study was not to test a specific theory, but rather to take an inductive approach that identified points of particular salience in participants' own accounts of their experience. NVivo software (version 12) was used to manage and store data. The first five interviews were coded independently by two authors (ERL and CAH) and then discussed to ensure consistency and appropriateness of categories before continuing analysis of remaining interviews. ERL is a postdoctoral researcher with training and experience in conducting and analysing qualitative interviews on behaviour change; CAH is a general practitioner and bariatric physician with experience in qualitative research who runs a specialist weight management service. ERL and CAH met frequently to discuss themes, and used a reflective code book to record decisions and to assist with theme refinement. A public representative (GDP) read and provided feedback on the same initial 5 interviews. They identified key points that they felt to be particularly important, and which resonated with their weight-loss journey. A comparison between the data for Maintainers and Regainers was then conducted, identifying differences in strategies. Throughout the process,

findings were discussed with ALA and RD to gain additional insight. Findings were discussed with GDP and with a Patient User Group Panel to assist with interpretation of results.

## **RESULTS**

Three main themes, with sub-themes, were identified: 1. Monitoring; 2. Planning; 3. Managing interpersonal relationships.

### **Theme 1: Monitoring**

Sub-themes identified were: i) Self-monitoring of behaviours, ii) Self-monitoring of weight, iii) Triggers for action.

#### *Sub-theme i): Self-monitoring of behaviours*

Many participants referred to self-monitoring of dietary behaviours as a key part of their weight-loss maintenance efforts. Maintainers continued to pay close attention to their dietary intake. They reported efforts to balance types and quantity of food throughout the day to facilitate an energy balance, particularly recognising the evening to be a time when they are prone to lapses. Some Maintainers described instances of utilising formal strategies to monitor their food intake, such as writing down or inputting foods into a tracking app.

*“...a tool...to measure what I was eating, which was also available for free, where you scan food and it’s got a huge database...” (P10196, Maintainer, male, aged 41, 52 weeks)*

Regainers' monitoring approach tended to be more relaxed and seemed not to be salient to them, making reference to weight-management as *"something in the background"* (P10493, male, aged 56, 52 weeks), that they *"keep an eye on [what they eat]"* (P30090, female, aged 54, 12 weeks) and were *"indirectly controlling [their weight]"* (P10110, male, aged 85, 52 weeks).

Although many participants perceived themselves as active, only a few explicitly described PA as exclusively for weight management; other reasons included improving mobility, recovery from illness/surgery and mental wellbeing.

*"...not just for the weight... I just zone out, and I just, for that time it's just me."*  
(P30217, Regainer, female, aged 52, 52 weeks).

There was little mention of actively monitoring PA. The few examples were offered by Regainers who either intended to or previously used tracking apps or pedometers, but not at the time of interview. Reasons for non-usage included childcare commitments and life events. A Regainer also stated: *"...I don't use the pedometer anymore because I know what I do now..."* (P30239, male, aged 74, 52 weeks). However, this interviewee felt that generally, other members of the public have difficulty estimating how active they are (e.g. over or under estimate their step count) so an objective measure would help them to accurately monitor their PA.

#### Sub-theme ii): Self-monitoring of weight

Using weighing scales was reported by some participants, more so by Maintainers, but usage frequency varied. A small number of Maintainers described self-weighing

as 'routine' (e.g. weighed themselves at least once a week), whilst others reported performing it occasionally or not at all. Interestingly, one Maintainer attributed their decrease in scale usage with an increase in weight.

A single Regainer reported that they: "*stand on scales every morning, just because they're in the bathroom*" (P10493, male, aged 56, 52 weeks). Nevertheless, this Regainer viewed this behaviour negatively as: "*...you do get fluctuations, and you get a wrong idea...*".

Reasons for non-weighing by both groups included reliance on clothes and appearance instead, not liking the results, inaccurate scales and it being a 'hassle'. However, weighing by another person had added salience. Participants in both groups desired continued external monitoring and most spoke positively of the public 'weigh-ins' during WW. This was illustrated by a Maintainer who continued attending WW for the purpose of continued weight monitoring and motivation:

*"It's, if I don't go I get lazy, and I don't really weigh myself at home so it's good to have that check-in you know..."* (P10218, female, aged 69, 52 weeks)

#### Sub-theme iii): Triggers for action

Indirect assessment through dissatisfaction with appearance (e.g. mirrors and photographs), body shape and clothing fit or size was commonly used as an indicator of weight change and triggered action. To a lesser extent, some participants spoke in terms of acceptable weight variations.

*“...the motivation is not buying anything bigger than a size 12” (P10218, Maintainer, female, aged 69, 52 weeks)*

*“...when I look at myself in the mirror... I see myself and I think, oh my God, it's time to get your act together woman...” (P10167, Maintainer, female, aged 67, 52 weeks)*

A few participants noted that by non-weighing, weight fluctuations may not be noticed and they were *“ignoring it and distracting myself from it” (P10062, Regainer, female, aged 43, 52 weeks)*. However, clothes and appearance provided reminders, with some actively avoiding mirrors or photographs.

*“...we've got a full-length mirror in our hallway...I don't even look at it, I just walk straight past. Whereas when I looked good I used to actively move the laundry basket out of the way, you know, just to look at myself...” (P10062, Regainer, female, aged 43, 52 weeks)*.

One Maintainer used clothes size as an indicator of too much weight-loss, as they perceived their current weight to be healthy for their age:

*“... if I go down any more trouser sizes or anything like that I think that's not good for me....” (P10509, male, aged 53, 52 weeks)*

## **Theme 2: Planning**

Sub-themes identified were: i) Compensating for lapses, ii) Planning for eating occasions, iii) Managing impulses, iv) Flexibility in dietary behaviours.

Sub-theme i): Compensating for lapses

Certain situations were recognised as ‘high-risk’ for a lapse due to the presence of unhealthy food or alcohol, such as at social events. Many Maintainers anticipated and had ‘planned lapses’, engaging in compensatory dietary behaviour pre or post-lapse to offset any increase in energy intake and not jeopardise their overall weight-loss maintenance efforts:

*“...we’ve got a couple of weddings coming up soon, so I’ll have to be a bit more careful that week and then you know, it’s very unhealthy stuff at weddings...”*

*(P10084, Maintainer, male, aged 63, 52 weeks)*

Dietary compensation was frequently mentioned, with only one participant (Maintainer) using PA in addition to small dietary changes to compensate for social events; no other participants used PA to recover from an acute lapse.

*“...have a few more glasses of wine than you should, which you know, you have to balance that. I’ll put my hand up, sometimes, yes, I do drink a little bit more, but hey-ho, I think, well I’ve got to do a longer bike ride or I’ll swim harder.”* (P10045,

*Maintainer, male, aged 67, 12 weeks)*

Sub-theme ii): Planning for eating occasions

On a daily basis, participants had to navigate situations and environments conducive to weight gain. A strategy used by Maintainers was to bring their own pre-prepared healthy foods. Instances included within the workplace and visiting friends and family when unsure what foods would be offered.

*“...if I go to the office I’ll take a punnet of plum tomatoes, this way at lunchtime I’ve got something to munch on...” (P10196, Maintainer, male, aged 41, 52 weeks)*

*“Where if I went to my daughter-in-law’s, if I was wanting to be good...I’ll bring my own...rather than go without or feel hungry and then have something that I shouldn’t have had.” (P10542, Maintainer, female, aged 67, 52 weeks)*

A few Maintainers spoke of making and storing extra portions of meals to prepare in advance for busy times to attempt to reduce reliance on convenience foods.

Regainers implemented this to a lesser extent and had mixed success with sustained engagement, including reports of ceasing due to boredom of same foods and difficulties preparing due to working hours. A Regainer who felt it was effective, attributed it more to family responsibilities.

*“...from my circumstances of having a young family, planning the week ahead was kind of crucial for us anyway as a family and helpful...” (P10062, female, aged 43, 52 weeks)*

### Sub-theme iii): Managing impulses

Previously used distraction strategies were employed to try to prevent acting upon hedonistic urges, eating out of boredom or to overcome hunger signals. Strategies Maintainers found effective included using social media, going for a walk and watching films. Many Maintainers drank water as a substitute ingestive behaviour

but, although a participant found eating fruit effective, they needed to revise this strategy in the light of their diabetes.

*'...I do buy a lot of sparkling water... the mint and the ginger or the lemon takes that craving away.'* (P10167, Maintainer, female, aged 67, 52 weeks)

*"...eating fruit I thought was working as a strategy... so although I think that's helped maybe lose weight it's not actually helped my blood sugar levels..."* (P10049, Maintainer, female, aged 54, 12 weeks)

Some Regainers employed similar strategies but were generally less convinced of their effectiveness. For example, a participant described drinking beverages as only having short-term beneficial effect as *"once I've had more than enough cups of coffee I'll crave."* (P30217, Regainer, female, aged 52, 52 weeks) Although, a Regainer did find it helpful to *"munch a bit of celery or carrot"* (P30231, male, aged 72, 12 weeks).

A few participants from both groups tried to manipulate their way of thinking and *"reframe that feeling of hunger"* (P10062, Regainer, female, aged 43, 52 weeks) with mixed results. A Regainer reported that: *"if you have an urge or you feel hungry is [I] just again let it pass and that works"* (P30239, male, aged 74, 52 weeks). Whereas others used motivational 'self-talk':

*"...I try to resonate [reason with] myself and say that, you know, you won't like it tomorrow when you go on the scale... the guilt stops me a bit, and not enough lately,*

*and that's why it's been going back up" (P10196, Maintainer, male, aged 41, 52 weeks).*

*"...why don't I try to say when you're feeling hungry that's one step further to being a size fourteen again?...I'm 43, it's not easy to change the way you think." (P10062, Regainer, female, aged 43, 52 weeks)*

A few participants used pre-planned strategies to limit their exposure to tempting foods. One Maintainer tried to avoid certain shopping aisles, whereas a Regainer revealed a lack of foresight by not preparing shopping lists despite noticing an increase in impulse-buying unhealthy foods.

*"... I'm that shopper that doesn't make a list... I'm an impulse buyer and it's always then the bad stuff..." (P30298, Regainer, female, aged 49, 52 weeks)*

No participants reported avoiding any social occasions at which they knew food would be present.

#### *Sub-theme iv): Flexibility in dietary behaviours*

Rather than adhering to prescriptive diets, most participants had flexibility in their dietary behaviours. Swapping carbohydrates, particularly bread, to a perceived lighter or less calorific alternative was common, especially by Maintainers.

*“...if I was craving for a cake or something, then I had a banana and it did seem, because that was sweet, you see, it'd take the craving away.” (P 30194, Maintainer, female, aged 63, 52 weeks)*

*“... I [weigh up] a cost of a biscuit compared to the pleasure it would bring, do I really want to spend 150 calories, no, I do not, I'll get a coffee...it's pretty much zero calories.” (P10196, Maintainer, male, aged 41, 52 weeks)*

Participants in both groups reported trying to control portion sizes of meals and unhealthy foods. There was also a focus on maintaining a lifestyle balance and long-term sustainability of healthy behaviours. However, one Maintainer highlighted that this could be a delicate balance.

*“...I did try to cut things out but you only... can do it for so long, but long-term...it's not a sustainable way to live.” (P10049, Maintainer, female, aged 54, 12 weeks)*

*“...now I'm more concerned about feeling good than my weight, so, but then if you do that for too long the weight goes back up.” (P10196, Maintainer, male, aged 41, 52 weeks)*

### **Theme 3: Managing interpersonal relationships**

Sub-themes identified were: i) Capitalising on social support, ii) Navigating the role of food.

*Sub-theme i): Capitalising on social support*

Some participants from both groups who were living with family members had changed the whole family's eating behaviours, with everyone eating healthier meals. A few participants from both groups were dependent on their partners for shopping and food preparation. Generally partners were supportive, providing healthy meals and reducing portion sizes. This also reduced the participants' personal responsibility to make these changes, which they may not have made themselves.

*"My wife was good at cutting back on portion size... I mean that the fact that she does the cooking, and can sort of control that without me sort of cheating..."*

*(P10493, Regainer, male, aged 56, 52 weeks)*

A few participants spoke favourably of medically-referred exercise classes they had attended, as members were of a similar ability and had the same aim.

*"...they give you what you're capable of doing and there's lots of people... who've had new knees or hips... You've not got someone in their lovely Lycra suits doing things that you think you only wish you could do! [Laughs]" (P10542, Maintainer, female, aged 67, 52 weeks).*

Some participants noted that family and friends were not currently providing active (verbal or practical) support. A Regainer suggested that this may be due to the longevity of their weight management journey and this lack of co-opting others could lead to complacency about behaviours:

*“... I don’t want to bother them, and then I start retreating, trying to think, and that’s where then I just think “oh I’ll just do nothing and just sit here then”. (P30298, Regainer, female, aged 49, 52 weeks)*

*Sub-theme ii): Navigating the role of food*

There were occasions when friends or family gifted or brought participants unhealthy foods. Maintainers generally resisted peer pressure, offering examples of re-gifting or delaying consumption for a weekend treat.

*“... well people give me gifts you know, I try and pass them on or wait until someone’s here, but I do allow myself at weekends and things a sort of treat ...” (P10218, Maintainer, female, aged 69, 52 weeks)*

However, despite her efforts to resist, a Maintainer spoke of her husband continually pressuring her.

*“...he sometimes gets a cob on with me because, especially if you’re in company and they’re all drinking vodka and Coke and gin and tonic and I’d say, “I’ll just have a water,” he doesn’t like it at all...but now and again he sneaks me one and thinks I don’t notice...but I don’t want it, he forces it on you...” (P30194, Maintainer, female, aged 63, 52 weeks)*

Some Regainers appeared to struggle and exhibited negative responses. One participant described feelings of anger when friends had brought cakes and then the participant later succumbed to the temptation. Others described how their family also

reacted to them eating unhealthily, with the participant negatively reacting to criticism and causing arguments.

*'...I get angry and then... eat it just for the sake of it because they've annoyed me they've got it [cakes]. That's just childish and that's just me, like I said self-sabotaging...'* (P30298, Regainer, female, aged 49, 52 weeks)

*'...this is a flashpoint in our relationship... he sees me eating a biscuit he gets cross with me and then I get cross that...I should be criticised about my choice of carbohydrates...'* (P10062, Regainer, female, aged 43, 52 weeks)

## **DISCUSSION**

The aim of this study was to compare the cognitive and behavioural strategies employed to overcome “lapses” and prevent “relapse” by people who had regained or maintained weight-loss five years after participating in a weight-management programme. Maintainers employed self-regulation techniques, anticipated potential lapses and made plans to compensate for these. However, few Maintainers reported self-weighing and this varied in frequency. Regainers also made some efforts to self-regulate their behaviour, but they did not tend to make plans, used relaxed dietary monitoring and struggled with navigating interpersonal relationships in relation to food. For both groups, PA appeared to have limited salience for managing lapses, there was no evidence of avoidance of ‘high-risk’ social situations and distraction strategies to overcome impulses were implemented by both groups but Regainers found them ineffective.

Our findings echo many elements of Greaves et al.'s review,<sup>7</sup> in particular, recognising self-regulation and managing internal and external influences as important themes for Maintainers. However, the idea of 'Regainers not self-regulating' and that 'Regainers do not manage influences' is not entirely supported here. Rather, our findings found many Regainers implemented some relaxed dietary monitoring and made some healthier swaps. Regainers also employed some distraction techniques to manage impulses but either used them inconsistently or found them ineffective. More salient was that they experienced problems around interpersonal relationships and food. Potential reasons for differences between our findings and those of Greaves et al.<sup>7</sup> are that only a few studies in their review made a comparison between weight trajectory groups, reducing the strength of evidence. Further, as previous studies had a shorter-term follow-up, potentially their participants had a more vivid recollection of the programme or may not yet be in the 'true' weight-loss maintenance phase as differing strategies may be used in the weight loss and weight loss maintenance phases.<sup>26</sup> Some studies also interviewed participants who had not previously participated in a weight-management programme.

Maintainers continued to pay attention to their dietary intake and it appeared to be more salient to them, compared to Regainers. Dietary self-monitoring is known to facilitate weight-loss maintenance,<sup>32</sup> increase feelings of responsibility, and heighten awareness of food intake.<sup>23</sup> Some Maintainers described instances of utilising formal strategies to monitor their food intake, such as writing down or inputting foods into a tracking app, in line with self-regulation focused behaviour maintenance theories.<sup>14,33</sup> However, despite its role in weight-loss maintenance,<sup>12,32,34,35</sup> self-monitoring of PA was little reported. Further, in contrast to previous studies<sup>16,18–20,23</sup>, PA was only

used by one Maintainer to counteract for lapses and additional weight gain, with dietary changes more commonly reported. The discrepancy between the two behaviours provides new insights into long-term weight-loss maintenance. Potential reasons may be due to dietary change being perceived to have a more immediate and substantial impact on weight, particularly as this has a strong emphasis in the WW program. However, given that participants often described themselves as active, it is also possible that PA had become habitual and a formal monitoring strategy was not required. Evidently further investigation is required into how weight management interventions could be improved to sustain PA over an extended period.

Self-weighing is a known method of improving weight management<sup>32,36–39</sup> but, interestingly, only a few of the Maintainers enacted this strategy and this varied in frequency. This contrasts with previous findings that weight maintainers implement this strategy,<sup>18,23,25</sup> and warrants further exploration in long-term studies. Clothes size and appearance were often prioritised, potentially being more appealing due to lack of disruption of routine, interpretation being intuitive and small weight fluctuations not making a noticeable impact. Importantly, Maintainers paid attention to fluctuations and used it as a trigger for action, echoing previous evidence<sup>18–20</sup>. The only Regainers to mention monitoring change in weight or shape did so without reflection. This is important as a previous study<sup>40</sup> found that reflection was a key process in moving from self-weighing to self-regulation.

Participants desired continual monitoring by a someone else, echoing evidence that soliciting assistance has been found to increase accountability, enhance motivational

support and is acceptable.<sup>21,25,28,39</sup> However, these reports may also be attributable to the memory of successful weight-loss during WW when they were weighed at each meeting.

A distinguishing feature between groups was that Maintainers engaged more in anticipatory planning than Regainers (e.g. planning for lapses at social gatherings and preparing for eating occasions). They may have a heightened awareness of lapse potential in high-risk situations or more self-efficacy to recover. Indeed, relapse prevention theory proposes that previous experience of applying effective responses in high-risk situations may actually increase an individual's self-efficacy and positive outcome expectancy, and decrease the likelihood of future relapse<sup>9</sup>. Our findings suggest that future weight management programmes may benefit from placing additional emphasis on self-regulatory planning strategies (e.g. weekly meal planning or goal setting), and should develop people's self-efficacy to manage in potential relapse situations.

Both groups implemented similar strategies to overcome impulses to eat food, but Regainers found them ineffective. This suggests that more in-depth exploration of other underlying factors and mechanisms is required. This could also help find ways to support sub-groups needing additional assistance to manage their weight.

Reflecting previous studies,<sup>22,23,41,42</sup> our data showed awareness of the benefits and need for long-term sustainability and flexibility of behaviours. Indeed, restrictive dietary behaviours can potentially increase feelings of deprivation, inducing temptation and lapses.<sup>10,23</sup> Contrary to other studies,<sup>22,28</sup> our findings showed no

evidence of avoiding social situations to restrict access to food and there was little mention of abstaining from eating in social situations. This is important as this type of avoidance may be socially isolating over an extended time period, especially if seeking a 'weight vs life balance'. This finding may not have been previously evident due to the short-term nature of previous studies, and provides a new insight into maintenance of behaviours in the longer-term.

Generally, participants' families showed an acceptance of the individual making dietary changes but our data also revealed instances of them challenging weight management, similar to previous studies.<sup>43,44</sup> A new insight was that Regainers had greater difficulty than Maintainers in navigating this challenge. Strategies supporting healthy interpersonal relationships could strengthen future programmes, such as information on communicating with partners/families.

### **Strengths and limitations**

A key strength of our study was the 5-year follow-up post programme; our findings offer unique insights into long-term maintenance. Our study made efforts to recruit a demographically diverse sample, including a high proportion of men, people from minority ethnic groups and a spread of socio-economic and geographic backgrounds. This ensures that our findings capture the experiences of a diverse group of people and application of our findings in future interventions should not widen further health inequalities. It should be noted that the Maintainers had a slightly larger proportion of participants over 65 years than Regainers and we cannot exclude the possibility that some differences in weight are attributable to age.<sup>45</sup> All interviews were conducted face-to-face and participants were offered a choice of

location, which facilitated rapport, made participants more comfortable, and may have elicited more detailed and in-depth information. Patient and public involvement (PPI) in our study enriched our findings and ensured we focused on topics important to this population. For example, our themes planning and monitoring particularly resonated with our PPI, providing further confidence in our findings. However, participants self-reported using strategies and we were unable to confirm how often or well they were implemented. Due to the length of time of follow-up, findings may be subject to recall bias but, this may have been reduced by using the objective measures of participants' weight at multiple time-points to orientate them in the interviews through their weight management journey. This data also ensured participants were correctly categorized for our analysis but, we acknowledge that some individuals that are close in weight may have been categorised differently due to our cut-off point. Some participants may also have reached their goals and viewed themselves as successful in weight-loss maintenance which may have influenced implementation of strategies, but this was not recorded. Further, participants had been allocated to different intervention lengths; those in the shorter intervention may have received less support and information on these strategies, therefore we acknowledge that this may have impacted their ability to implement them in the longer-term. Our findings should be understood in that context.

## **Conclusions**

This study provided an in-depth exploration of the cognitive and behavioural strategies employed to overcome "lapses" and prevent "relapse" by people who had regained weight or maintained weight-loss after participating in a weight management programme. Comparison of findings between the two groups suggest

that monitoring, planning and managing interpersonal relationships are crucial strategies for successfully maintaining weight loss maintenance. New important insights into long-term weight maintenance include the absence of PA self-monitoring strategies or using PA to counteract lapses, little avoidance of high-risk social occasions, and that few Maintainers engaged in regular self-weighing. Further, both groups implemented distraction strategies for managing impulses but Regainers found them ineffective and also struggled to navigate interpersonal relationships. The findings of our study have already been successfully put into practice; they have been used to guide the content of an online acceptance-based intervention for weight loss maintenance. Subsequent studies should also test how these findings can be successfully integrated into programmes and through different delivery modes. Healthcare providers should incorporate these strategies in future programmes to equip participants with the skills to enact these strategies in the longer-term and prevent weight regain.

**CONFLICTS OF INTEREST STATEMENT:**

AA is the Chief Investigator on two publically funded (MRC, NIHR) trials where the intervention is provided by WW (formerly Weight Watchers) at no cost outside the submitted work. AJH reports receiving personal fees from Slimming World, outside the submitted work. CAH reports education work and consultancy: Alva, Oviva, Orexigen Therapeutics, Kastech, Ethicon, Mundipharma, Consilient Health, Nestle, and Novo Nordisk, outside the submitted work. ERL, RD, GDP and SJG have no conflicts of interest.

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ALA conceived the original idea for the study. ALA, SJG, CAH, AH and RD wrote the application for funding and contributed to the design of the study. ERL contributed to the design of the study, conducted the interviews, analysed the data and drafted the manuscript. CAH, RD, GDP, AJH and ALA contributed to the data analysis and interpretation of results. All authors have contributed to the revision of successive drafts of the paper and approved the final manuscript.

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## ETHICAL APPROVAL:

Ethical approval was gained on 28<sup>th</sup> November 2017 from the West Midlands - Coventry and Warwickshire Research Ethics Committee (Application number: 17/WM/0432).

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Table 1: Summary of participant characteristics and intervention length

Participant characteristics		Maintainer (n=10) N (%)	Regainer (n=16) N (%)	Total (n=26) N (%)
Gender	Male	4 (40.0)	7 (43.8)	11 (42.3)
	Female	6 (60.0)	9 (56.3)	15 (57.7)
Age	40 - 50	1 (10.0)	5 (31.3)	6 (23.1)
	51 – 64	4 (40.0)	5 (31.3)	9 (34.6)
	≥65	5 (50.0)	6 (37.5)	11 (42.3)
	Mean (years):	61.5	60.1	60.6
	Range (years):	41-71	43-85	41-85
Ethnicity	Asian or Asian British	1 (10.0)	2 (12.5)	3 (11.5)
	Black or black British	0 (0.0)	2 (12.5)	2 (7.7)
	Chinese	1 (10.0)	0 (0.0)	1 (3.8)
	White or white British	8 (80.0)	12 (75.0)	20 (76.9)
Education level	No qualification	1 (10.0)	0 (0.0)	1 (3.8)
	GCSE or equivalent	3 (30.0)	6 (37.5)	9 (34.6)
	A level or equivalent	2 (20.0)	3 (18.8)	5 (19.2)
	University degree	1 (10.0)	5 (31.3)	6 (23.1)
	Higher degree	3 (30.0)	2 (12.5)	5 (19.2)
Employment status	Employed	8 (80.0)	10 (62.5)	18 (69.2)
	Retired	2 (20.0)	6 (37.5)	8 (30.8)
Household income	< £20,000	1 (10.0)	7 (43.8)	8 (30.8)
	£20,000 - £39,999	5 (50.0)	4 (25.0)	9 (34.6)
	≥ £40,000	2 (20.0)	4 (25.0)	6 (23.1)
	Unknown	2 (20.0)	1 (6.3)	3 (11.5)
Intervention length*	12 weeks	3 (30.0)	7 (43.8)	10 (38.5)
	52 weeks	7 (70.0)	9 (56.3)	16 (61.5)
Location	Cambridge	9 (90.0)	6 (37.5)	15 (57.7)

	Liverpool	1 (10.0)	10 (62.5)	11 (42.3)
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\*Length of active intervention WW

Table 2; Weight of participants at multiple follow-up time points from baseline

Time point	Average weight (kg; SD)		
	Overall (n=26)	Maintainers (n=10)	Regainers (n=16)
Baseline	98.3 (19.4)	103.6 (26.6)	94.9 (11.9)
12 weeks	91.5 (17.9)	96.4 (24.4)	88.4 (11.0)
52 weeks	89.5 (17.7)	94.6 (22.6)	86.3 (12.8)
End of intervention*	90.0 (9.2)	95.1 (8.9)	86.8 (3.5)
24 months	93.7 (18.6)	97.4 (24.1)	91.3 (13.7)
5 years	94.5 (13.2)	91.3 (16.7)	96.5 (9.9)

\*12 or 52 weeks from baseline, dependant on group allocation