Chapter

Long-Term Weight Loss Maintenance

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Abstract

Weight maintenance can be considered a challenge for all patients who are in a reduced obese state. In this chapter, we first provide an overview of the chances for maintaining weight loss, how physiological adaptations and psychological dynamics lead to weight regain in the long-term, and of the factors that have been associated with long-term success. Then we review what is known about the patient perspective on that critical time period following weight loss, focusing on the experience of barriers and facilitators as well as attempted strategies. Finally, we introduce an approach for providing a targeted and individualized support at this stage.

Keywords: obesity, weight loss, weight loss maintenance, weight regain, lifestyle intervention, behavior change

1. Introduction: is weight maintenance a losing battle?

The importance of weight loss for people in the western world is reflected by a growing diet industry that is providing easier, faster, and more powerful products. In addition to public demand, the diet industry keeps growing because many of their products simply work, i.e., they do enable customers to reduce their body weight short-term. Socio-cultural ideals of beauty and attractiveness are major motivators for reducing body weight even if it already falls within a healthy norm. However, for approximately 20% of adults in western societies, losing weight has become a health-related issue as they are suffering from obesity. It has been shown that comorbidities of obesity such as cardiovascular diseases, joint damage, or diabetes as well as quality of life significantly improve when weight is reduced [1]. However, the same way it has been shown that short-term weight loss is achievable for many people, it has become clear that only few are successful in the long-term [2, 3]. The authors of a recent systematic review concluded that substantial weight loss cannot be sustained by the average person in the absence of a continued follow-up intervention [4]. Moreover, behavioral treatments have been questioned ethically with respect to the claim of permanent weight loss [5]. However, recent data suggest that treatment programs comprising of intensified lifestyle interventions with continued support can lead to longer-term weight loss [6]. Therefore, a better understanding of the interaction between physiological and psychological barriers to weight maintenance has been recommended as well as the development of more individualized and targeted strategies.

2. What makes weight loss maintenance challenging?

A number of physiological and psychological factors have to be emphasized in order to understand the challenge of weight loss maintenance. Physiologically, weight loss induces metabolic adaptations that favor weight regain by creating an energy gap [7–9]. These comprise the hormonal regulation of appetite, satiety, and satiation as well as resting energy expenditure. Energy expenditure is lowered beyond what changes of body composition predict and this might be due to adaptive thermogenesis, that is, the capability of the human body to reduce energy expenditure by producing less body heat [10]. Moreover, there is evidence that at least some of these changes can last over several years, even after partial weight regain [11, 12].

Psychologically, it is known that the effect of health behavior interventions generally diminishes over time, and that behavior maintenance has to be regarded as a separate challenge [13]. Five overarching themes have been associated with behavior maintenance and may explain why it is difficult to achieve, i.e., maintenance motives [...], self-regulation, resources, habits, and contextual influences [13]. With respect to weight maintenance, it has to be considered that adherence not just to a single but to a whole set of behavior is required in order to balance and regulate energy intake and expenditure [14]. These changes comprise areas such as meal structure, eating behavior, food shopping, calorie counting, alcohol consumption, exercise, stress management, sleep, leisure activities, and vacation. Although they are referred to as a single change of lifestyle, the difficulties to maintain each associated behavior change may rather accumulate than complement. In accordance with this is the observation that even after several years of successful weight maintenance, its execution is still experienced as a burden [15].

Taken together, weight loss maintenance is a challenge because it requires actively counteracting a possibly infinite physiological resistance against weight reduction as well as the psychological tendency to relapse from health behavior changes of which many are necessary for long-term maintenance. Therefore, after successful weight loss, obese patients should not be treated as cured, normal-weight people, but rather as reduced obese individuals [16].

3. Factors associated with weight loss maintenance

Despite its physiological and psychological challenges, a considerable number of patients are able to minimize weight regain [17]. This has been attributed to personal characteristics such as internal motivation, social support, self-efficacy, novelty seeking, or sleep chronotype, as well as to a set of specific behaviors observed in successful maintainers such as high levels of physical activity, compliance to a low-energy diet with a regular meal rhythm, flexible eating restraint, portion control, control of over-eating, self-monitoring, immediate regulation of weight gain, and active problem solving [18–23].

Notably, successful maintenance practices seem to differ from successful weight loss practices [24]. In recent reviews, energy intake on one side and energy expenditure on the other have been used as a framework to explain how different determinants may affect weight maintenance [8, 20]. According to this view, any factor or strategy that enables a weight-reduced patient to permanently reduce calorie intake will support weight maintenance. Similarly, any strategy that enables a patient to permanently increase energy expenditure will support maintenance as well. It has to be noted that none of these determinants are believed to alter the physiological adaptations associated with weight loss but rather help to

minimize their impact. In other words, it is assumed that a cognitive control of energy regulation is an inevitable necessity.

Although several determinants of successful weight loss maintenance have been observed, intervention studies reported mainly disappointing results [17, 25, 26]. An increase of physical activity and exercise, for example, is clearly predictive of weight loss maintenance, but when applied as a clinical intervention in randomized controlled trials, its effectiveness remains questionable, especially in the long-term [27, 28]. The reason for this is still not clear but an important factor could be adherence. Therefore, additional mediators need to be identified that may explain why some patients continue pursuing weight maintenance behaviors and some others are not [22]. For example, the contribution of novel neuropsychological factors such as executive functioning and neurocognitive control to weight loss maintenance have been recently discussed [16, 29]. Another important approach for improving long-term adherence might be the provision of more tailored and multidisciplinary weight loss maintenance strategies [14]. This requires a deeper understanding of the patient perspective [30].

4. The patient perspective

In order to provide a tailored support after weight loss, it is crucial to understand the patient perspective on weight loss maintenance. What do patients experience during this time? How do the physiological and psychological challenges translate into the individual's perception and what measures do they undertake in response to that and with what kind of perceived success? These questions can be answered by identifying factors that patients perceive as threats and factors that they perceive as facilitators during weight loss maintenance. It might also be useful to identify the different maintenance strategies patients rely on and their experience with them. Most studies have used qualitative designs to explore how patients experience and explain their success or failure during weight maintenance, respectively. Although the transferability of a single qualitative study may be limited, a more valid view can be generated by thematically synthesizing many of them [31]. To expand insights gathered by qualitative studies, it could also be helpful to utilize quantitative designs in future studies of patient perspective [30, 32].

4.1 Barriers

A great variety of barriers to weight maintenance have been revealed by reviews of qualitative studies on patient perspective (**Table 1**). For example, in one review, the identified barriers included bad weather conditions such as extreme winters, poor health and sickness, lack of motivation (e.g., due to previous failure, body image, or eating for reasons other than hunger), lack of time management, problems at home (e.g., due to the inability to afford a healthy lifestyle), festivities, and past stigmatizing experiences [33]. Additional barriers, identified in another review included maladaptive habits, poor self-regulation skills, emotional problems, social-cultural factors (e.g., pressure, saboteurs, and social commitments), and environmental limitations (e.g., feeling unsafe to exercise in the neighborhood) [34]. Identity conflicts and negative beliefs about weight management are two more barriers patients experience during weight loss maintenance [31]. It is possible that a considerable overlap between some of these barriers exists and that they can be reduced to a small number of main barriers [30]. It is also noteworthy that the perception of barriers and their relevance for actual weight regain could change over time and there might even be moments when some patients are not experiencing

Barriers	Facilitators	Strategies
• Bad weather conditions • Poor health and sickness • Lack of motivation • Lack of time management • Problems at home • Festivities • Past stigmatizing experiences • Maladaptive habits • Poor self-regulation skills • Emotional problems • Social-cultural factors • Environmental factors • Identity conflict • Negative beliefs about weight management	• Identity shift • Psychological commitment and preparedness to integrate weight management strategies into everyday life • Environmental factors • Socio-cultural factors • Improved self-perception	• Self-motivation/ self-reinforcement • Self-monitoring • Adoption of a food choice system • Establishing a non-food reward system • Habit formation • Restructuring the environment • Accepting and committing to weight loss maintenance as a lifelong challenge • Balancing eating restraint and flexibility • Being open for building new relationships

[a]*Main themes according to recent reviews of qualitative studies [31, 33, 34].*

Table 1.
Main barriers, facilitators, and strategies of weight loss maintenance from patient perspective.[a]

any barriers to weight loss maintenance [30, 35]. Also, despite the experience of external barriers and facilitators, many patients may still take mostly personal responsibility for weight maintenance as excess weight is oftentimes attributed to unhealthy, modifiable behaviors [34].

In one of our studies, we found that patients who had been successfully treated for severe obesity were experiencing four main barriers to weight loss maintenance during the first 3 years after treatment completion [30]. The first barrier, 'Hedonic Hunger', reflected difficulties arising from food-related pleasure and the struggle with availability of highly palatable foods. The second barrier, 'mental distress', reflected difficulties arising from stress, emotional eating, and mental issues. The third barrier, 'Binge Eating', reflected difficulties arising from subclinical loss of control eating, binge episodes, boredom, and craving. The last barrier, 'Demoralization', reflected several difficulties arising from an implicit demoralized state, a low self-efficacy and helplessness such as lacking social support, finances, health, and motivation. Each barrier was found to be relevant for weight regain, but also that time could be a mediator. In particular, "Binge Eating" was found to be most critical at the beginning of weight loss maintenance and 'Mental Distress" at later stages.

4.2 Facilitators

Perceived facilitators of weight maintenance that have been revealed by reviews of qualitative studies include an identity shift (e.g., living healthily became a need), a psychological commitment, and preparedness to integrate weight management strategies into everyday life, environmental factors (e.g., healthy choices are visible, available and attractive), socio-cultural factors (e.g., support and engagement by friends, family, colleagues, and professionals), and an improved self-perception due to successful weight loss (**Table 1**) [8, 31, 33, 34]. However, the experience of facilitation can differ inter-individually. For example, for some patients, social support seems to be irrelevant [36], and past stigmatizing experiences seem to inhibit

some patients for a long time, whereas others are rather motivated by them in the short- and long-term [33].

4.3 Strategies

Patients who are able to maintain weight loss report several strategies to explain their success including self-motivating and reinforcing strategies (e.g., consciously enjoying physical activity as a new quality of a weight-reduced life; intentionally turning dieting and exercise into meaningful hobbies), self-monitoring (e.g., app-based monitoring of food intake, physical activity, and body weight), adoption of a food choice system to reduce energy intake (e.g., preferring high-grade, unprocessed foods), establishing a nonfood reward system for weight maintenance (e.g., buying clothes), habit formation (e.g., avoiding the candy isle; parking faraway), restructuring the environment (e.g., food storage at home; avoiding high-risk situations), accepting and committing to weight loss maintenance as a lifelong challenge, balancing eating restraint and flexibility (e.g., having a slightly relaxed mind-set, faith in the process, testing limits, and consciously plan for occasional treats and even lapses), and being open for building new relationships (e.g., when former relationships loosen due to an incompatibility with the new lifestyle) (**Table 1**) [15, 36–38]. It should be noted though that successful weight maintainers may not use these strategies consistently, and the differences to unsuccessful patients could therefore be less pronounced than previously assumed [36]. Also, the burden patients associate with implementing weight maintenance strategies seems to remain much higher compared to lifetime weight stable persons who are relying on comparable strategies [15].

So far, mainly strategies that successful patients employ have been explored. In contrast, it is less clear which strategies less successful patients try to employ and how that relates to their weight regain and failed recovery attempts. For example, less successful patients oftentimes end up not eating breakfast, a strategy consistently reported by weight maintainers [23]. Is that because they have never managed to eat breakfast on a regular basis, because they discontinued it prior to regain, or because they discontinued it after weight began to regain? In other words, is it a lack of behavior change, behavior maintenance, or self-efficacy?

4.4 The experience of tension as a psychological core issue

According to a recent psychological model that integrated findings from 26 qualitative studies on perceived barriers, facilitators, and strategies, the core issue for patients during weight loss maintenance is the experience of tension [31]. This tension is a conceptualization of the aforementioned burden that patients associate with adhering to the strategies required for long-term success. However, the novelty of this model is that it (a) assumes variability of the tension, (b) suggests that barriers, facilitators, and strategies are relevant to the degree they are affecting a patients' individual tension, and (c) classifies all of these factors with respect to one of four key concepts, that is, "sources of tension", "modifiers of tension", strategies for "managing tension", and strategies for "reducing the tension":

- "Sources of tension" are comprised of psychological factors such as old habits and impulses, beliefs about identity, beliefs about weight management, and unmet needs.

- "Modifiers of tensions" are comprised of barriers and facilitators such as environmental and social factors, as well as health, finances, and other personal circumstances.

- Strategies for "reducing the tension" are comprised of developing automaticity, meeting needs more healthily, and changing beliefs and self-concept.

- Strategies for "managing the tension" are comprised of learning and insight, self-regulation, managing internal and external influences, and willpower or motivation.

Most of the patient experience revealed by qualitative studies can be explained by using this framework, and therefore, the introduction of this model could be an important step to shift the research focus forward. Particularly, there is a need for prospective studies to evaluate the predictive value of patient perspective ensuring that it does not reflect merely post-hoc rationalizations. Furthermore, the contribution of physiological adaptations, probably as a "source of tension", to the psychological dynamics of weight maintenance should be evaluated.

5. Providing support during weight loss maintenance

With respect to the available findings on patient perspective as well as our own experience, we suggest that an ideal weight loss maintenance treatment program comprises of two components, one provided during and immediately after weight loss in a structured manner, and one provided and tailored as part of a longer-term follow-up care.

5.1 Structured component of a weight loss maintenance program

The structured component of a weight loss maintenance program should promote early (i.e., already at the weight loss stage) cognitive-behavioral changes such as habit formation that will later help reduce the tension of weight loss maintenance. Additionally, during the transition from weight loss to maintenance, this component should support the development of strategies for managing the tension (**Table 2**) [31]. An important cognitive goal of this component is to help patients accept the challenge of weight loss maintenance early, so they have time to make a psychological commitment and be prepared for integrating weight management strategies into everyday life (facilitator of WLM). Therefore, weight loss maintenance treatment ideally begins during the last weeks of the weight loss stage, when weight reduction is just starting to level off. Ways to support early acceptance include psychoeducation, cognitive restructuring (e.g., by increasing awareness of already achieved improvements), and introduction of former patients as role models. This acceptance also requires acceptance of the end of the current weight loss episode. The latter is not easy for many patients because they are experiencing weight loss as a rather euphoric state with rapid success and regular reinforcement due to social adoration, improved quality of life, and health. Also, they are feeling in control of their disease and some might even feel cured, expecting to continue until some far-away ideal weight is being reached. Therefore, it is essential for them to gain insight into the fact that weight loss is going to cease, largely due to physiological adaptations, and that it is psychologically healthier, easier, and more functional to start focusing on maintenance than further weight loss. For this purpose, it can be helpful to emphasize differences between the two (**Table 3**).

5.2 Tailored longer-term follow-up care

The second component of an ideal weight loss maintenance treatment program should provide tailored interventions as part of a longer-term follow-up care.

Strategy[a]	Interventional tools	Examples
Reducing the tension		
Developing automaticity	Stimulus control Habit formation Nudging Model learning	• Eating before food shopping • Parking further away from the office • Move the TV out of the living room • Joining a fitness tracker community
Meeting needs more healthily	Cognitive restructuring Problem solving Mindfulness-based stress reduction Social skills training Physical activity Exercise	• Identify pleasant aspects of vacations that are not food related • Feeling healthy by eating healthy food • Learning to say 'no' • Using exercise performance as an indicator of success
Changing identity	Cognitive restructuring	• Showing others who you were and who you want to be • Associate personal values with healthy choices • Photo shoot • Joining a Nordic walking group
Changing beliefs about weight management	Psychoeducation Cognitive restructuring Model learning	• Appreciating the weight loss outcome • Accepting the weight maintenance challenge • Getting to know successful maintainers
Managing the tension		
Self-regulation, learning and insight	Psychoeducation Diaries, protocols, Apps	• Self-monitoring • Using social accountability • Becoming aware of personal risk factors • Flexible eating restraint • Recognizing lapses and relapses • Owning up to and growing from lapses • Relapse recovery
Managing internal and external influences	Psychoeducation Acceptance-based treatment	• Anticipating, planning, and avoiding at-risk situations • Defusing food cravings
Willpower or motivation	Buddying Self-help	• Patient-led workshops • Sharing success with new patients

[a] *Strategies adopted from a conceptual model of the dynamics of weight loss maintenance [31].*

Table 2.
Approach to a structured weight loss maintenance treatment.

The time frame should be at least 3 years after weight loss, as these years are most critical with respect to weight regain [39]. During this time, a continuous assessment of body weight change, cognitive-behavioral changes, emergence of barriers, and loss of facilitators should be performed to allow immediate intervention. To get a more valid picture, data can be recorded by patients prior to a consultation [36]. With respect to the different barriers patients are experiencing, at least five tailored interventions may need to be offered.

A first intervention should be targeted towards patients who are primarily experiencing difficulties due to festivities, environmental factors such as food availability, social-cultural factors such as peer pressure, and old habits. Practicing

	Weight loss period	Weight loss maintenance period
Main goal	Body weight reduction (fat mass reduction)	Identity change ("healthily living person")
Time frame	3–6 months	3+ years
Dietary focus	Calorie reduction ("less") Rigid adherence	High-grade ("better") Planning & remaining flexible
Physical activity Focus	Decreasing sedentary times Adhere to exercise plans	Habitual physical activity Enjoying physical activity/exercise
Motivation	Continuous success due to weight loss (improvements of health, quality of life, self-perception) Group support Compliments	Improved mobility, new choices, new freedom Healthy lifestyle as a hobby (experiences, insights, exchange, role model) Continuous success due to exercise (improvements of physical fitness, body composition)
Required Willpower	Very high at beginning Later context dependent	High at beginning Later intermittently
Help & support	Regular external monitoring Multi-professional treatment Exchange with others	Like-minded people and groups Professional consultation

Table 3.
Example for how weight loss maintenance can be emphasized as a separate challenge to patients.

stimulus control techniques, social skills, and mindfulness eating might help these patients to gain back control over externally triggered hedonic eating motives.

A second intervention should be targeted towards patients who primarily report emotional problems, lack of time management, or negative beliefs about weight management. Stress prevention and reduction trainings might help these patients to free the resources necessary to pursue healthy behaviors again and to not rely on emotional eating as a coping mechanism. Of note, some of these patients may need to be referred to psychotherapy to treat an underlying affective disorder.

A third intervention should be made available to patients who primarily experience a lack of control over eating in the absence of clear external or emotional causes. A training comprising of acceptance-based and cognitive-behavioral techniques, proven effective for the treatment of binge eating disorder, might be helpful.

A fourth intervention should be made available for patients whose primary issue is a directly experienced lack of motivation or who are demoralized by the experience of barriers seemingly out of their control such as bad weather conditions, poor health and sickness, financial problems at home, a lack of social support, or poor body image. Training these patients in problem-solving might enable them to find solutions for their respective issues and more importantly, may increase their self-efficacy and beliefs in long-term success. Self-efficacy can be further promoted by applying methods such as mentoring, adequate goal setting, action planning, and motivational interviewing. With respect to body weight, it should be considered that stabilization of a partly regained weight is a more realistic goal for recovery than anew weight loss [40].

A fifth intervention should be made available for patients who are experiencing identity conflicts as their primary issue such as discomfort with the new body, social insecurities, or inhibition by past stigmatizing experiences. Cognitive-behavioral techniques can be used to dispute potentially idealizing of the former obese self or

an exaggerated significance of body image to self-worth. They can also be used to help patients seek and build on self-esteem fostering situations. Psychoeducation about optional plastic surgery after weight loss might be offered as well.

As described before, it is likely that patients are experiencing several of the barriers in parallel or intermittently during weight maintenance. However, we think it is still beneficial to treat one barrier at a time in order to focus on behavior and cognition instead of weight loss to achieve long-term improvements.

6. Conclusion

Weight loss maintenance is a complex physiological and psychological challenge associated with a high risk of failure. Studies on patient perspective have revealed valuable information on how this process is experienced. Although generally experienced as an ongoing burden, the underlying psychological tension is variable and moderated by a number of now well-defined barriers, facilitators, and strategies. With this novel information, a more tailored long-term support can be provided which may help improve weight loss maintenance.

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