Hindawi Publishing Corporation
Journal of Obesity
Volume 2011, Article ID 348293, 11 pages
doi:10.1155/2011/348293

Review Article

Cognitive-Behavioral Strategies to Increase the Adherence to Exercise in the Management of Obesity

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Received 5 June 2010; Accepted 5 October 2010

Academic Editor: Neil King

Physical activity plays a major role in the development and management of obesity. High levels of physical activity provide an advantage in maintaining energy balance at a healthy weight, but the amount of exercise needed to produce weight loss and weight loss maintenance may be difficult to achieve in obese subjects. Barriers to physical activity may hardly be overcome in individual cases, and group support may make the difference. The key role of cognitive processes in the failure/success of weight management suggests that new cognitive procedures and strategies should be included in the traditional behavioral treatment of obesity, in order to help patients build a mindset of long-term weight control. We reviewed the role of physical activity in the management of obesity, and the principal cognitive-behavioral strategies to increase adherence to exercise. Also in this area, we need to move from the traditional prescriptive approach towards a multidisciplinary intervention.

1. Introduction

Physical activity plays a major role in human obesity. In epidemiological studies, physical activity levels were highly predictive of age-related weight gain [1, 2], and also low levels of recreational physical activity were associated with the 10-year changes in body weight gain [3]. Unfortunately, the amount of exercise needed to produce weight loss and to provide weight loss maintenance may be difficult to achieve in obese subjects, particularly in a "toxic" eating-promoting environment [4]. Mayer et al. suggested that it might become very difficult in the presence of a surfeit of food to maintain energy balance at a healthy weight in the presence of a very low level of physical activity, considering that this would imply an unsustainable calorie restriction [5]. Thus the focus for a normal weight should be more properly moved from diet and diet composition to the levels of physical activity able to match calorie intake [6].

Unfortunately, for most individuals with obesity, the adoption of exercise as a consistent lifestyle behavior is hindered by several physical, psychological, and environmental obstacles [7, 8]. This underlines the importance of recognizing the psychological determinants of exercise behavior, and developing effective strategies to improve the patient's adherence to exercise.

In this paper, we address four main topics: (1) the role of exercise in weight loss programs, (2) the problem of adherence to exercise, (3) the cognitive behavioral strategies to engage patients in increasing their level of exercise, and (4) the cognitive behavior strategies to increase patients' adherence to exercise.

2. The Role of Exercise in Weight Loss Programs

2.1. Exercise and Weight Loss. The importance of physical activity in successful intervention programs for weight control has been recognized for many years. Weight-loss interventions incorporating exercise components are more effective in promoting long-term weight loss in overweight persons than are interventions that rely on dietary instruction alone [9]. Over 90% of participants in the National Weight Control Registry (NWCR), a database of successful

Table 1: Recommendations for physical activity in the management of obesity [13].

Evidence statements and recommendations on PA for weight loss and WL maintenance	Level of evidence	Evidence statements and recommendations on combined therapy (Diet + PA) for WL and WL maintenance	Level of evidence
(i) PA in overweight or obese adults results in modest WL independent of the effect of caloric restriction through diet	A	(i) The combination of a reduced calorie diet and increased PA produces greater WL than diet alone or PA alone	A
(ii) PA in overweight or obese adults modestly reduces abdominal fat	B	(ii) The combination of a reduced calorie diet and increased PA produces greater reductions in abdominal fat than either diet alone or PA alone, although it has not been shown to be independent of WL	B
(iii) PA in overweight or obese adults modestly increases cardio-respiratory fitness independent of WL	A	(iii) A combination of a reduced calorie diet and increased PA improves cardiorespiratory fitness as measured by $VO_{2\,max}$ when compared to diet alone	A
Recommendation: PA is recommended as part of a comprehensive WL program because it:		*Recommendation*: The combination of a reduced calorie diet and increased PA is recommended, since it produces WL, decreases abdominal fat, and increases cardiorespiratory fitness	A
(i) modestly contributes to WL in overweight and obese adults	A		
(ii) may decrease abdominal fat	B		
(iii) increases cardiorespiratory fitness	A		
(iv) may help maintenance of WL	C		

PA, physical activity; WL, weight loss.

weight loss maintainers (over 30 lbs for at least 1 yr, on average over 60 lbs for 5.5 yr), report losing weight with food restriction and physical activity [10]. The amount of weight loss directly related to physical activity *per se* is probably low, considering the much lower degree of energy imbalance created by increased physical activity than by food restriction, but anyway it is greater than zero [11], and other advantages are expected. In subjects engaging in physical activity, a higher proportion of weight loss comes from fat [12], thus preventing the loss of lean mass which accompanies calorie deficit. Total energy expenditure would thus be higher after weight loss with physical activity versus food restriction alone, providing an advantage in weight loss maintenance.

Increased physical activity is indeed one of the best predictors of long-term success in weight reduction. In the 1998 NIH report on obesity [13], twenty-four RCT articles were considered for the evaluation of the effects of physical activity on weight loss. The frequency of exercise varied from 3 to 7 sessions/week, and the duration ranged from 30 to 60 minutes, at an intensity to elicit a heart rate from 60 to 85 of the individual's estimated maximum heart rate, corresponding on average to 70% of maximum aerobic capacity ($VO_{2\,max}$). The report concludes that physical activity is recommended as part of a comprehensive weight loss therapy and weight maintenance program for several reasons having a variable category of evidence (Table 1).

2.2. Exercise and Weight Loss Maintenance. Weight loss maintenance has not been systematically examined by the NIH report [13], but the report of the American College of Sports Medicine indicates that progressively increasing exercise to 200–300 minutes (3.3–5 hours) of exercise per week facilitates the long-term maintenance of weight loss [14]. Higher targets might be easily achievable by overweight people and might thus be more beneficial for long-term weight loss.

Data from the NWCR indicate that successful weight maintainers report higher levels of physical activity (on average 2800 kcal/wk) than the traditional recommended physical activity target (1000 kcal/wk) for weight control [15] This amount seems to be a reasonable target to prevent or reduce weight regain [16]; in the NWCR, a decrease in physical activity below this target (equal to 60–90 min/day of moderate-intensity physical activity) was a predictor of weight regain over time [15]. A more recent analysis of the registry confirmed these results [17]: NWCR participants were confirmed to be an extremely physically active group and the level of activity when entering the registry was related to the magnitude but not the duration of weight loss. However, the amount of activity was extremely variable, and no single recommendation for the optimum amount of physical activity for weight loss maintenance could be developed [16].

The need of high levels of physical activity to maintain body weight has been confirmed by a randomized study [18]. After 18 months, the participants allocated to intense activity (approx. 2500 kcal/wk of exercise) had a better weight loss maintenance than those allocated to moderate levels of activity, and maintained a 50% larger weight loss. The study,

Table 2: Main reasons for not engaging in physical activity reported by obese subjects during group sessions in our Unit, and possible strategies to increase motivation and adherence.

Reasons for not exercising	Barriers	Strategies to increase adherence
"I would like to exercise, but I feel immediately tired and breathless, and my knees hurt"	Low fitness, pain	Exercising with individuals having the same limits, to reduce the intensity of exercise
"I do not like exercising, it is boring"	Boredom, lack of stimuli	Planning enjoyable activities or amusing exercising (e.g., group dancing or walking)
"I do not like exercising alone, but when I go walking with friends I realize that I slow down the group, which makes me feel inadequate"	Comparison with other individuals	Exercising with subjects having similar problems, in order to avoid competition
"Exercising in a gym or a swimming pool or even walking in a public garden makes me feel ashamed, observed, judged, mocked at"	Body image dissatisfaction	Arranging a protected environment, and specific courses (gym or swimming pool) for obese persons
"I'd like to exercise, but I have no time. Back from work, I am too tired and I have to take care of my family"	Time constraints	Reorganizing daily activities fitting exercise as a priority. Turning everyday activities into exercise (using stairs, walking to work, etc.)
"The weather was horrible; I had to stay at home"	Weather constraint	Planning short walk in small groups; reducing objectives but maintaining change and adherence
"I feel so bad when I exercise, that I feel as if I am going to die"	Death fear	Increasing goals very slowly, to avoid any sense of breathlessness

Most patients report difficulties in engaging in physical activity and in the maintenance of behavior changes. In general, patients underline the importance of low goal setting, new stimuli, social support, and long-term contact with therapists.

however, raised two important issues of concern. First, the injury rate was consistently greater in the group randomized to the high-intensity activity program [8], and injuries may be a relevant cause of attrition. Second, despite intense activity, the rate of weight loss progressively reduces and a modest weight regain might also be observed. This might be an additional cause of reduced self-efficacy and attrition.

In summary, data from the literature support the hypothesis that weight loss and weight loss maintenance are regulated by the total energy expenditure of the activity rather than from the intensity of activity [19].

2.3. Benefits of Exercise in the Clinical Setting. The benefits of physical activity largely outweigh weight loss. Both walking and vigorous exercise are associated with substantial reductions in the incidence of cardiovascular events [20], and these advantages are maintained also among subjects among groups at high cardiovascular risk [21, 22]. An extensive meta-analysis showed that both adiposity, measured by BMI or by waist circumference, and physical inactivity are important determinants of mortality risk [23]. Physical activity may protect from diabetes and the metabolic syndrome. In several studies, physical exercise has shown a protective effect against metabolic diseases via decreased body weight and visceral fat accumulation, HDL cholesterol levels, reduced triglycerides, and blood pressure [24, 25]. These last changes may also be independent of weight loss. In a population-based cohort, high-risk men regularly engaging in vigorous leisure-time physical activity (LTPA) or with high cardiorespiratory fitness were less likely to develop the metabolic syndrome than sedentary men [26]. Data were confirmed in aged individuals [27].

In a post-hoc analysis of the Finnish Diabetes Prevention Study, a randomized controlled trial of lifestyle changes including diet, weight loss, and physical activity in the prevention of type 2 diabetes in subjects at risk, individuals who increased moderate-to-vigorous or strenuous, structured physical activity were less likely to develop diabetes during the 4.1-year follow-up period [28]. Low-intensity LTPA and walking also conferred benefits, suggesting that the incidence of type 2 diabetes may also be modulated in high-risk individuals. At the end of the study, participants who were still free of diabetes were further followed up for a median of 3 years, and the incidence of diabetes remained lower in the intervention group. The risk reduction was related to the success in achieving the intervention goals of weight loss, reduced intake of total and saturated fat and increased intake of dietary fiber, and increased physical activity [29].

Similar data were reported in the US Diabetes Prevention Program, where the prevention of diabetes was achieved by healthy diet, weight control, and activity goals. In the intensive group, the activity goal (150 min/wk) was initially achieved by 74% of participants and by 67% in the long-term, and meeting activity goals was associated with sustained weight loss [30].

3. The Problem of Adherence

The incorporation of exercise as a consistent lifestyle behavior is not easy for many obese individuals because of poor exercise tolerance and enjoyment [7]. Several factors create obstacles to physical activity of obese and normal weight individuals, such as low motivational status, self-efficacy, negative learning history with exercising, lack of coping skills, and aversive environmental characteristics such as reduced access to physical activity facilities, high costs of training programs, low social and cultural support, and

time barriers [8]. Making individuals with obesity move and improving adherence to exercise is a critical challenge: hence the importance to understand the psychological determinants of exercise behavior. We report in Table 2 the main reasons for not engaging in physical activity reported by obese subjects during group sessions in our Unit, and the possible solutions to increase motivation and adherence. Most patients feel that these strategies may be relevant to start physical exercise, but do not guarantee maintenance. This consideration stresses the importance of low goal setting, new stimuli, social support, and long-term contact with therapists (see below).

3.1. Psychological Predictors of Physical Activity. Existing theories and research on the psychological predictors of success in exercise suggested that self-efficacy, the stage of change, expectations, and psychological well-being may be particularly important. However, they also suggested conflicting hypotheses about the ways in which these factors impact upon adherence.

The stage of change theory [31] suggests that the take-up and maintenance of health behaviors, such as exercise, follows a number of stages, namely, precontemplation, contemplation, preparation, action, and maintenance [32]. The theory suggests that subjects in the contemplation or precontemplation stages (who have limited or no thought to exercising) will never adhere to exercise counseling, compared with subjects in the preparation stage (who already intended to exercise and may have given it considerable thought).

Self-efficacy, one of the most consistent predictors of exercise adherence [33], is related to stage of change [34, 35]. Self-efficacy refers to the extent to which an individual believes they are capable of carrying out a behavioral change, and increasing self-efficacy will lead to increased effort and time being devoted to the task [36]. In the context of the stage of change theory, precontemplators are expected to show lower self-efficacy than contemplators, whereas those in the maintenance stage show the highest [34]. Self-efficacy may also predict progression between stages [37].

On the other hand, too ambitious expectations may preclude success. This theory is supported by studies showing that subjects scoring high on a measure of expectancy-value (but low on self-efficacy) were most likely to give up [38, 39]. Both high expectancies of change and violation of these expectancies predicted lack of adherence in previously sedentary women who started a structured physical activity program [39].

The initial psychological well-being may also be relevant to adherence. It is very likely that poor psychological well-being might influence people's ability to adhere to behavioral changes. The energy available for self-change efforts is probably limited, and mental stress may decrease the available energy [40]. In addition, poor psychological well-being may have an impact on confidence and self-efficacy, favoring attrition. In a study measuring the comprehensive role of participant expectation, self-efficacy, stage of change, and psychological well-being in adherence to an exercise program, subjects who completed the course had lower expectations of change and came closer to achieving expected changes than those who dropped out [41]. While self-efficacy improved in completers, it tended to deteriorate in dropouts. This finding suggests that overly optimistic expectations may lead to disappointment and attrition in physical activity programs. Interventions to ensure realistic expectations might increase success and prevent potential negative effects of failure.

In the US Diabetes Prevention Program [42], greater readiness for change in physical activity level, higher exercise self-efficacy, and lower perceived stress, depression, and anxiety scores correlated with higher levels of baseline activity and maintenance of activity levels at 1 year and at end of study. These findings may help determine which patients are most likely to increase physical activity levels in lifestyle intervention programs.

4. Cognitive Behavioral Strategies to Engage Patients in Increasing the Level of Exercise

Most physicians are well aware of the importance of a healthy diet and exercise to promote weight loss and weight loss maintenance and know the optimal target of physical activity as suggested by National and International Agencies and Guidelines, but a minority have received adequate training during their university curricula to establish an effective communication to promote lifestyle change.

4.1. Key Principles to Enhance the Motivation to Change. Similar to other motivational enhancement approaches [43], cognitive behavior therapy adopts key principles to enhance the motivation of patients to address behavioral changes [44]. First, it conceptualizes motivation as a dynamic entity waxing and waning as a function of shifting personal, cognitive, behavioral, and environmental determinants. Second, it adopts a collaborative therapeutic style as opposed to a confrontational approach. Third, it validates patients' experience within the framework of a balance between acceptance and change, firmness, and empathy. Fourth, it uses the functional analysis of the pros and cons of a belief or behavior because change seems facilitated by communicating in a way that elicits the person's own reasons for the advantages of change. Fifth, it does not address resistance with confrontation, but with a collaborative evaluation of the variables maintaining the dysfunctional behavior. Sixth, it supports patients' self-efficacy.

Following these key principles, clinicians should validate the experience of the patients by acknowledging with them the perceived positive effect of exercising and (if present) the ambivalence to change. At the same time, clinicians should inform patients on the negative aspects of sedentary life and the benefits of engaging in healthy exercising.

4.2. Educating Patients about the Benefit of Exercising. The first step is educating patients about the benefit of exercising and the need to increase the level of physical activity for long-term weight control. The principal pieces of information that patients should know on the benefit of exercising are as follows.

(i) *Physical activity may help preserve fat-free mass during weight loss*. About 75% of weight lost by dieting is composed by fat and 25% by fat-free mass (FFM) [45]; adding a physical activity program to dietary therapy may reduce the loss of FFM [45, 46].

(ii) *Physical activity increases energy expenditure*. The amount of energy expenditure depends on the intensity, duration of the activity, and on the muscle group involvement. The increase in energy consumption associated with activity occurs primarily during the activity itself, but there is also a short-lived postexercise increase in metabolic rate [47].

(iii) *Physical activity alone results in minimal weight loss*. Exercise alone, without any dietary intervention, produces minimal weight loss (i.e., an average 2 kg decrease in body weight compared with a control group) [18, 48, 49].

(iv) *Physical activity generally does not increase short-term diet-induced weight loss*. Most studies found that adding exercise to dietary therapy does not significantly increase short-term weight loss compared with dietary therapy alone [50–53].

(v) *Physical activity plays an important role in the maintenance of weight lost*. Cross-sectional studies and retrospective analyses of prospective trials found that successful long-term weight loss is associated with the maintenance of regular exercise [53–55].

(vi) *Considerable physical activity is necessary for weight loss maintenance*. The amount of physical activity required to reduce the rate of weight regain seems to be larger (e.g., 2500 kcal/wk = walking 75 min/day) than the moderate-intensity exercise recommended by the American College of Sports Medicine and the Centers for Disease Control and Prevention to maintain good health (1000 kcal/wk = walking 30 min/day) [18, 56].

(vii) *Exercising at home improves adherence to a physical activity*. Data from prospective randomized trials have shown that long-term adherence to a walking program is better in participants assigned to walk at home compared with those who were randomized to a supervised on-site program [57, 58]. A home-based physical activity program is associated with greater long-term weight loss than group-based programs [58], where barriers to exercising (e.g., cost and time constraints) may reduce attendance.

(viii) *Short bouts of exercise might improve the adherence to programmed activity*. A randomized control trial showed that women with obesity assigned to four short (10-minute) bouts of exercise 5 days weekly had greater adherence to exercise and weight loss than those assigned to one long (40-minute) bout of exercise 5 days weekly, for 20 weeks [59], although larger studies did not replicate the results [19, 57].

(ix) *Weight maintenance can be achieved with either programmed or lifestyle activity*. Increasing daily lifestyle activities is as effective as a structured aerobic exercise program in maintaining long-term weight loss [60].

(x) *Aerobic fitness, independent of body fat, is associated with health gains*. Irrespective of body fat or weight loss, aerobic fitness is associated with lower cardiovascular mortality [61] and a decreased risk of diabetes [62].

4.3. Creating a "Pros and Cons to Change" Table. The second step involves creating a "pros and cons to change" table. Patients should be asked to evaluate their reasons for and against adopting an active lifestyle. Clinicians should emphasize that change is a necessary step to achieve a long-term weight control and to improve the physical and psychosocial negative effects of obesity. It is advised to begin by asking patients to list the cons of changing, considering whether sedentary life provides them with something positive that they are afraid to lose. Then patients are asked to evaluate in detail the pros of changing their lifestyle. In doing this, clinicians should urge patients to reflect on the short- and long-term effects of changing activity levels on health, psychological function, and relationships. The list of pros and cons should be put on a table and discussed in detail. During this discussion, clinicians should urge patients to focus on the long-term goals and not just on the present. Every reason for change should be reinforced. It is also important to analyze the cons of changing, helping patients reach the conclusion that the positive aspects of increasing the level of activity are attained in the long term, and are always associated with positive gains.

The importance of discussing with the patients the pros and cons of lifestyle changes is proved. In a recent study, adding motivational interviewing (i.e., a brief intervention approach eliciting the patients' own reasons and arguments for change) to a behavioral weight control program improves weight loss outcomes and glycemic control in specific groups of overweight women with type 2 diabetes [63].

4.4. Involving Actively Patients in the Decision to Change. The final step is to help patients reach the conclusion that adopting an active lifestyle will be a positive opportunity for a new and healthy life and long-term weight control. A key aspect of engagement is to stimulate patients to make spontaneously statements such as "If I start exercising I will ..." because it is the sign that they see the need to change their lifestyle. In these cases, clinicians should make a confirmatory statement such as "I realize that you have decided to try and change your exercise habits". At this point, clinicians should actively suggest that patients should try to change.

5. Cognitive Behavioral Strategies to Increase Patients' Adherence to Exercise

In the last 20 years, several cognitive behavioral strategies have been found to improve the patients' adherence to exercise, and should be included in the treatment of obesity.

5.1. Assessing Patients' Activity Levels. An initial assessment is needed to determine the patient's current activity levels. Clinicians should ask patients how they judge their actual level of physical activity, and if they believe that it is adequate to lose or maintaining body weight. If, as usual, patients report being sedentary, clinicians should ask the reasons of their sedentary life, and if there are barriers to exercise (e.g., arthritis).

The presence of medical comorbidities (e.g., dyslipidemia, hypertension hyperinsulinemia, metabolic syndrome, and diabetes) may require additional medical evaluations, including an exercise testing and/or appropriate medical supervision during exercise.

5.2. Tailoring Activity Goals to Individual Patients. Clinicians should evaluate which type of activity is physically possible for patients, and the barriers that can prevent a successful increase in activity. Accordingly, they should assist patients in developing a physical activity plan, based on the initial assessment.

Physical activity should be started at a low level and gradually increased to a goal of 150–200 minutes per week in selected patients [65]. Compliance to exercise can be enhanced by increasing lifestyle activities (e.g., climbing stairs, gardening, and walking the dog), developing an appropriate home-based exercise program, and considering short bouts rather than long bouts of activity for patients who "can't find the time to exercise". There are many practical recommendations for physical exercise in weight loss programs [64], as outlined below. Note that the aim of behavior therapy is to provide patients cognitive and behavioral skills to modify their lifestyle. Accordingly, these recommendations should not be intended as prescriptions, but should be tailored on patients' preferences.

(i) Engage in moderate-to-vigorous exercise for at least 60 minutes on most days (at least 5 days per week).

(ii) Walking may be the preferred exercise (unstructured exercise may be included in routine daily activities).

(iii) Check the baseline number of steps by a pedometer, then add 500 steps at 3-day intervals to a target value of 10,000–12,000 steps per day.

(iv) Jogging (20–40 min/day), biking or swimming (45–60 min/day) may replace walking.

(v) Physical exercise is intended to produce a calorie deficit of at least 400 kcal/day, favoring weight loss, maintaining muscle mass and preventing weight cycling.

Clinicians should always keep in mind that obesity *per se* is an important barrier to physical activity, as it poses several unique challenges to the obese individual [66]. The most typical barriers reported by patients are "being too fat, shy or embarrassed to exercise", "being too lazy or unmotivated", "having an injury or disability" or "being not the sporty type" [67]. Women with obesity reported lower pleasure ratings during exercise of increasing intensity and lower energy scores immediately after the exercise than nonobese women [68]. These two factors may partly explain the lower level of participation to exercise of obese individuals. A careful assessment of barriers to physical activity caused by obesity *per se* is mandatory in all cases and exercise prescription must be changed accordingly (e.g., switching to non-weight-bearing exercise, or to lower-intensity exercise).

5.3. Self-Monitoring. Self-monitoring (of energy intake and expenditure) is the cornerstone of the behavioral treatment of obesity. The larger the use of self-monitoring, the larger the amount of weight loss [69]. Monitoring raises patients' awareness of their exercise habits and helps them identify ways to maximize their energy deficit. Physical activity can be recorded in a monitoring record in minutes (of programmed activity) and/or steps (of lifestyle activity), using a pedometer [70]. Patients interested in having a more precise measurement of their daily caloric expenditure may use an accelerometer, that measures total energy expenditure, the energy expenditure in physical activity, the duration and the levels (METs) of physical activity and sleep time. Patients may also benefit from recording activities, moods, and thoughts associated with exercising. This information may help identify obstacles to exercising. Self-monitoring records can also be used to provide information to identify activity contingencies that can be targeted for intervention [70].

5.4. Stimulus Control. These strategies are based on the principles of classical and operant conditioning. The main focus is to modify the external environment to make it more conducive to making choices that support exercising. Patients should be instructed not only to remove triggers of inactivity, but also to increase positive cues for healthy activity (e.g., lay out exercise clothes before going to bed). Stimulus control may also be used to reinforce the adherence to exercise by establishing a reward system (e.g., encouraging patients to set weekly behavioral goals and to reward themselves in case of achievement, not through food or inactivity)[70].

The efficacy of stimulus control strategies has been demonstrated since the late 70s, when behavioral weight loss programs produced a weight loss of approximately 4.5 kg over 10 weeks without the prescription of any specific caloric intake or energy expenditure [71].

5.5. Involving Significant Others. Social support is a key ingredient for behavioral change. Data show that social support is considered to be an important aid for weight maintenance [72, 73], and significant others may play an important role in encouraging patients to increase daily physical activity and to reinforce the changes. With the consent of patients, clinicians should involve significant others in the treatment in order to create the optimum environment for patients' change.

Significant others should be educated about obesity, weight management, and physical activity. They also should be actively involved in exploring how to help patients develop and maintain an active lifestyle. The needs vary from patient to patient; the general advise to give to significant others

include creating a relaxed environment, reinforcing positive behaviors, adopting a positive attitude, exercising together and accepting patients' setbacks.

5.6. Building the Mindset of an Active Lifestyle. Cognitive processes are involved in the maintenance of complex behaviors, such as developing an active lifestyle. The role of cognitive processes implicated in weight loss and weight maintenance has been extensively evaluated in the QUOVADIS study, a large observational study on quality of life in obese patients seeking treatments at 25 medical centers certified by the Italian Health Service for the treatment of obesity [74]. The study provided three main results. First, drop-out was associated with higher weight loss expectancies [75]. Second, the amount of weight loss was predicted by increased dietary restraint and reduced dietary disinhibition [76]. Third, a long-term weight maintenance (>3 years) was observed in patients satisfied with the results achieved, and confident to control their body weight without additional professional help [77], a construct similar to the concept of self-efficacy that is associated with greater adherence to physical therapy [78].

Cognitive strategies are scarcely used in standard behavior programs for weight control, and this may be one of the reasons for their limited effectiveness [79]. There is a need for adding new and more effective cognitive interventions to the standard strategies to help patients develop a mindset of long-term weight control, as follows.

(i) *Encourage patients to make a list of personal reasons to adopt an active lifestyle*. Clinicians should ask to review the list every day and when they feel in difficulties, in order to train the mind to focus on weight control and exercising.

(ii) *Set short-term goals and cognitive credits*. Goal setting is a key component of cognitive-behavior therapy for weight loss and has been shown to be effective in focusing the attention of participants toward behavior change [80]. Patients should be encouraged to set specific and quantifiable weekly goals (e.g., increasing 1,000 steps a week), which should be realistic and moderately challenging [70]. The achievement of these goals is generally associated with a sense of accomplishment, which is reinforcing and enhances self-efficacy [81]. Patients should learn how to use cognitive credits once they reach their activity goals using positive sentences towards themselves (e.g., "I've been good", "I'm doing great", "I have the ability to lose weight and to change into an active lifestyle"). The regular use of cognitive credits may help patients reduce their frustration associated with weight loss and strengthen their confidence of being able to control body weight and to maintain an active lifestyle.

(iii) *Address weight loss expectations and weight loss satisfaction*. The association between higher weight loss expectations and attrition indicates that the problem of weight loss goals should be addressed both in the initial interview and during the entire course of the treatment. However, encouraging participants seek only modest initial weight losses does not facilitate weight maintenance, and produces a lower weight loss than standard behavior weight loss treatments [82]. At the beginning of treatment, it is more useful to focus patients on weekly weight loss and to detect and address promptly any warning sign of weight loss dissatisfaction, thus minimizing the risk of attrition [75]. In our clinical experience, unrealistic weight loss expectations may be changed later in the course of treatment, when patients have reached some intermediate goals, and the rate of weight loss is declining. Specific strategies to change weight goals have been recently described in the modern cognitive behavioral treatments of obesity [83]. A crucial aspect favoring the modification of unrealistic weight goals is the development of a trusting and collaborative relationship between the clinician and the patient [75]. This is also a key factor in avoiding the sense of abandonment that patients report as one of the main reason of attrition [84].

(iv) *Address obstacles with problem solving*. Clinicians should train patients in using problem solving to address problems that hinder exercise adherence. The typical problem-solving approach includes 5 steps [85]. Step 1 encourages patients to describe a problem (i.e., an obstacle to exercising) in great detail, and the chain of events (that is, situations) that preceded the problem. Step 2 helps patients brainstorm any possible solution. During step 3, patients are encouraged to list the pros and cons for each potential solution. In step 4, patients should choose the best option on the basis of the previous analyses, to be implemented for a fixed amount of time. Finally, during step 5, the patients evaluate the results achieved. If the solution failed, the process should be repeated. Specifically, once patients identify a problem, they should write "Problem" in their monitoring record and then turn the record over and address it by writing out the five problem-solving steps. Mental, unwritten problem-solving is much less effective. Support to the importance of incorporating problems solving in the management of obesity comes from a study in which the participants who completed cognitive therapy coupled with problem solving had significantly greater long-term weight loss than participants who completed standard behavior therapy [86].

(v) *Cognitive restructuring*. Through this technique, patients learn how much thoughts influence both mood and behaviors, and that a more rational and functional way of thinking can help improve adherence to lifestyle programs [70]. Cognitive restructuring is used to modify cognitive biases (all-or-nothing thinking) about weight regulation and to correct unrealistic weight loss expectations.

5.7. Responding to Nonadherence. Long-term adherence to an active life-style and weight control can be extremely difficult because of a complex combination of biological, environmental, and psychological pressures. Clinicians should congratulate the patients for every small successes they achieve, and should never criticize failures [87]. Criticism may produce guilt and loss of self-confidence, leading to attrition. An unconditional acceptance of the patients' behavior and a problem-solving approach to address barriers will preserve the clinician-patient relationship. This approach will also help patients understand that the long-term success in weight management is related to a set of skills rather than simply to willpower.

6. Conclusions

The development of new methods to facilitate patients' increased physical activity, and the long-term maintenance of physical activity is fundamental for the maintenance of weight loss and for reducing the health risk of individuals with obesity.

To date many strategies may be used to improve adherence. Data from literature indicate that patients who exercise at home, as compared with on-site (i.e., health club or clinic), have better adherence to exercise and/or lose more weight [58, 88]. Similarly, multiple short bouts of activity (i.e., 10 minutes) are at least as effective in facilitating exercise adherence and weight loss, as a single long bout (i.e., 40 minutes) [57, 59]. Short bouts give more opportunity to individuals to fit exercise into a busy day, such as using stairs rather than escalators or walking rather than driving the car. Lifestyle intervention is as effective as the traditional structured exercise for improving cardiorespiratory fitness and weight control [60, 89] and may be a good alternative for those who do not like to practice sport. Independent of weight control, fit-fat people have a lower incidence of cardiovascular mortality [61] and a decreased risk of developing diabetes [62].

Unfortunately, weight loss maintenance can only be achieved with an activity-related energy expenditure of approximately 1,500–2,500 kcal/wk, as compared with the 1,000 kcal/wk traditional target of behavioral programs [18]. For most individuals with obesity, it is difficult to achieve such high levels of physical activity. Therefore, it is advisable to encourage subjects to start with activity goals they can achieve rather than with very ambitious goals they are likely to fail, and to increase gradually the daily activity levels.

In summary, we need to move from the traditional prescriptive approach to diet and exercising, towards a more multidisciplinary intervention aimed at increasing the adherence to physical activity. The key role of cognitive processes in the failure/success in weight loss and maintenance [74–77] suggests that new cognitive procedures and strategies should be included in the traditional behavioral treatment of obesity, in order to help patients build a mindset of long-term weight control.

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