Behavior Therapy for Nonalcoholic Fatty Liver Disease: The Need for a Multidisciplinary Approach

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Nonalcoholic fatty liver disease (NAFLD) is systematically associated with insulin resistance and the metabolic syndrome, where behavior therapy remains the primary treatment, simultaneously addressing all the clinical and biochemical defects. However, very few studies have tested the effectiveness of intensive behavior therapy in NAFLD, aimed at lifestyle modifications to produce stable weight loss by reduced calorie intake and increased physical activity. Searching the literature for studies testing weight loss and lifestyle modifications for the treatment of NAFLD, only 14 reports were traced where the entry assessment satisfied well-defined criteria. The final effectiveness was based on hard histological outcomes in 5 cases. All but 1 were pilot, uncontrolled studies or limited case series, and in general the details of treatment were scanty. In only 3 cases treatment was carried out along the guidelines of behavior treatment to reduce excess nutrition and increase exercise; in these cases, a remarkable effect on weight loss and an improvement in liver histology were reported. The principles of behavior therapy are presented in detail, to help physicians change their prescriptive attitude into a more empowerment-based approach. A brief section is also included on the practical aspects and public policies to be implemented at societal level to obtain the maximum effects in lifestyle changes. There is a need for multidisciplinary teams including dietitians, psychologists, and physical activity supervisors caring for patients with NAFLD. Alternatively, general practitioners and physicians working in gastrointestinal units should limit their intervention to engage patients with NAFLD before referral to specialized teams set up for the treatment of diabetes and obesity. (HEPATOLOGY **2008;47: 746-754.)**

Nonalcoholic fatty liver disease (NAFLD) is a relevant challenge for gastroenterology and liver units. The disease is highly prevalent in the Western countries (approximately 25%-30% of the adult population),[1] and 1 patient in 3 is expected to have nonalcoholic steatohepatitis (NASH), which has the potential to progress to cryptogenic cirrhosis and advanced liver failure. NAFLD is associated with metabolic syndrome and its individual components,[2,3] and both being overweight or obese[4] and having prediabetes/type 2 diabetes[5] have been identified as risk factors for disease progression. Accordingly, NAFLD treatment and the prevention of disease progression are largely based on weight loss and insulin-sensitizing drugs, even if only a few controlled studies are available. In most cases, both the control and the experimental group were given nutritional counseling, with some extra drugs (insulin-sensitizers, antioxidants, lipid-lowering, and the like) in the experimental arm. The problem in all these studies lies in the definition of the lifestyle-modifying control treatment.

We have already brought to the attention of the scientific community a superficial attitude in the definition of programs aimed at lifestyle modifications.[6] In general, the programs referred to as "nutritional counseling" are not structured according to the principles of behavioral treatment, and the intervention is limited to diet prescription.

Abbreviations: NAFLD, nonalcoholic fatty liver disease; NASH, nonalcoholic steatohepatitis.

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Behavioral therapy is an area of research extensively applied to the treatment of obesity and associated metabolic diseases. Treatment is usually offered individually or in groups of 10-15 participants in weekly sessions of 60-90 minutes each for months.[7] This intensive program determines a mean weight loss of 10% of initial weight within 6 months in subjects who complete treatment (about 80% of those entering the program). Although patients typically regain part of their lost weight within 1 year, most of them maintain a healthy weight loss ≥5% body weight,[8] and continuing treatment facilitates weight maintenance.[9]

Several trials of behavioral treatment in conditions largely dependent on unhealthy lifestyles have been carried out in the last few years. In the area of type 2 diabetes, both the Finnish Diabetes Prevention Study[10] and the U.S. Diabetes Prevention Program[11,12] have shown that behavior therapy is much more effective than usual care or metformin treatment in the prevention of diabetes in obese adults with prediabetes, and the beneficial effects are long-lasting.[13] A recent meta-analysis confirmed that lifestyle intervention is at least as effective as drug treatments.[14] In subjects with overt type 2 diabetes, the participation in programs aimed at behavioral modifications (including increased physical activity) improves metabolic control and reduces drug use.[15,16] Lifestyle modification involving moderate physical activity and diet was also effective in preventing diabetes in Asian Indians, despite their relatively low body mass index and insulin-resistance features.[17] Similar data are available in the prevention of overt hypertension in subjects with above-optimal blood pressure or untreated stage 1 hypertension.[18]

We reviewed all NAFLD studies having nutritional counseling or lifestyle modifications as alleged experimental treatment, to verify their effectiveness and adherence of reported protocols to the principles of behavior therapy. The basic concepts of behavior therapy are also given, together with the practical aspects and public policies to be implemented at societal level, in order to facilitate physicians operating in gastroenterology and liver units in their task to implement lifestyle modifications in NAFLD cases.

Literature Review on Lifestyle Modifications in NAFLD/NASH

Methods

In a comprehensive review of the literature on weight loss, lifestyle modification, and exercise from 1965 to 2002,[19] Wang et al. identified 517 potentially relevant studies of which only 15 met strict predefined criteria. Only 3 trials had a control group, only 1 of these 3 was randomized, but was published only in abstract form in 1990. More recently, Clark identified only 3 controlled trials (n = 89 subjects) on the effects of weight loss through lifestyle modification in NAFLD.[20] We researched MEDLINE, the Cochrane Hepato-Biliary Group Controlled Trials Register, the Cochrane Controlled Trials Register on The Cochrane Library, EMBASE (1985 to 2001), the Science Citation Index, and the Current Contents from 2002 to March 2007 to identify other potentially relevant studies. A variable combination of the following search terms (in the titles and the abstracts) was used: [*(steatosis, fatty liver, steatohepatitis, NAFLD, NASH, nonalcoholic, body mass index, diabetes, overweight, obesity) AND (weight loss, behavio(u)r therapy, counsel(l)ing, diet therapy, lifestyle (modification), exercise, physical activity (exercise), energy restriction, (very) low-calorie diets) NOT (pharmacological treatment, pharmacological therapy, drugs)*]. In addition, we checked the bibliographies of relevant published articles and the abstracts of the annual meetings of the European Association for the Study of the Liver and the American Association for the Study of Liver Diseases (from January 2002 to March 2007), but the abstracts not followed by a publication in extenso were excluded because the protocol of treatment was not explained.

By restricting the search to humans, we ended up with 1621 studies (46 reviews), most of them concerning diet and exercise therapy in diabetes and/or obesity, without mentioning NAFLD/NASH or measuring fatty liver content. By excluding all the single-case reports and limiting the search only to [*fatty liver OR steatohepatitis OR steatosis OR NAFLD OR NASH*] and omitting [*body mass index OR diabetes OR obesity OR overweight*], we ended up with only 26 studies. Several papers dealt with lifestyle interventions combined with surgical or pharmacological treatments[21-27] or were experimental studies carried out in selected series of diabetic patients, where liver fat content had been quantified by highly sophisticated imaging techniques, namely hepatic magnetic resonance spectroscopy.[28-30] All these studies were also excluded, unless the separate effects of behavior modifications could be determined. Finally, we considered and analyzed only those satisfying the following criteria:

(a) NAFLD or NASH diagnosed either by liver histology analysis or by imaging (ultrasounds or computed tomography scanning or magnetic resonance spectroscopy) or by persistent hypertransaminasemia (as surrogate marker);

(b) Exclusion of other causes of liver disease, including an excessive alcohol intake (≥20 g/day or ≥140 g/week).

Table 1. Published Studies on the Effects of Diet Prescription for Weight Loss in Patients with NAFLD/NASH Diagnosed Mainly with Either Liver Biopsy or Radiological Imaging

Author [Ref] (year)	Study Design, Diagnosis, and Population	Type of Intervention and Duration of the Study	Measured Outcome	Main Results	Problems and Comments
Eriksson[31] (1986)	- NASH case series - Diagnosis by US and liver biopsy - 3 obese patients	- Calorie restriction - 10-12 months	- Liver enzymes	- Liver enzymes normalized in all cases	- Study design - Limited case series - Prescriptive intervention
Knobler[32] (1999)	- Prospective pilot study - Diagnosis by US and liver biopsy - 48 overweight or obese pts (44% of them with diabetes) - Steatosis confirmed by liver histology in 16	- Low-fat diet (American Heart Association) - Oral hypoglycaemic or lipid-lowering drugs as needed - 6 months	- Liver enzymes - Fasting glucose	- Improved glucose - Improved liver enzymes (96% of cases) - Liver enzymes normalized in 50% of patients who lost weight	- Study design - No posttreatment assessment of liver disease
Okita[33] (2001)	- Fatty liver series - Diagnosis by US - 14 obese patients	- Moderately energy-restricted diet (25 kcal/kg/day) - 6 months	- Liver enzymes - Abdominal US	- Improved liver enzymes - Weight loss - Reduced steatosis at US	- Study design - Lack of histology
Tendler[34] (2007)	- Prospective pilot study - Diagnosis by liver biopsy - 5 obese patients in the BMI range 30 to 40 kg/m^2	- Low-carbohydrate ketogenic diet (CHO $<$ 20 g/day, supplemented with vitamins) - 6-month dietary intervention - Follow-up, 24 months	- Liver enzymes - Histology - Insulin resistance (Insulin, HOMA)	- Biopsy assessed steatosis and necroinflammation significantly at follow-up - Fibrosis improvement borderline significant - Nonsignificant improvement in liver enzymes and insulin	- Study design - Limited case series

Abbreviations: BMI, body mass index; CHO, carbohydrates; liver enzymes = AST and ALT; US, ultrasound.

Results and Comments

According to the above criteria, only 17 studies were left (Tables 1 and 2),[31-47] but 3 of them carried out in obese children were also excluded,[45-47] because the methodology of lifestyle intervention is different in adolescents. Only 4 prospective pilot studies explored the effect of dietary intervention in NAFLD, without any counseling on physical exercise (Table 1).[31-34] In all cases, liver enzyme levels improved after weight loss and normalized in 50% of cases or more. In the last study, the prescription of a ketogenic diet, causing a mean weight loss of nearly 13 kg, produced a posttreatment histological improvement in steatosis, inflammation, and fibrosis (not significant).[34] In all studies, the methodology to achieve compliance to diet was based on prescription, without any attempt to produce stable lifestyle modifications.

The remaining 10 studies (Table 2), including a retrospective series, used dietary counseling and various types of approaches to increase physical activity.[35-44] They are all subject to criticism in terms of study design and/or duration. Only 3 studies were controlled.[37,38,43] In the first study, randomized against no therapy,[37] the treatment approach was fully prescriptive, in contrast with current guidelines on behavior treatment. The second study was a trial of vitamin E supplementation, where lifestyle modifications were beneficial in both arms, without any additive effect of vitamin E.[38] The last study confirmed the benefits of a lifestyle approach, with an additive effect of orlistat on weight loss.[43] One study, with an intensive program of lifestyle modifications, was only based on liver enzyme assessment and no posttreatment measurement of liver fat.[40] Only in 3 cases was the schedule of behavior intervention reported in detail,[41,42,44] with a specific focus on physical activity in one study.[42] In only 4 cases were hard outcomes selected (liver biopsy before and after treatments, performed in the majority of subjects),[37,39,41,43] but the number of patients was very limited and in no cases was histology graded according to the most recent proposal of the Pathology Committee of the NASH Clinical Research Network.[48]

In summary, excluding the public employees of the Suzuki study,[40] exactly 264 overweight or obese patients were enrolled in studies of lifestyle intervention for their liver disease. Considering the heterogeneity in study design and outcome assessment, as well as the variable effect of any additional pharmacologic treatment, the results indicate that appropriate counseling programs are effective in NAFLD/NASH patients. Structured programs of behavior therapy improve not only insulin resistance, liver enzymes, and hepatic fat content, but also the grade and stage of hepatic inflammation and fibrosis. However, several key questions remain: (1) Are physicians operating in gastrointestinal and liver units aware of the background and principles of behavior therapy? (2) Are they trained to

Table 2. Published Studies on the Effects of Behavior Therapy to Reduce Calorie Intake and to Increase Physical Exercise in Patients with NAFLD/NASH Diagnosed Mainly with Either Liver Biopsy or Radiological Imaging

Author[Ref] (year)	Study Design, Diagnosis, and Population	Type of Intervention and Duration of the Study	Measured Outcome	Main Result	Problems and Comments
Palmer[35] (1995)	- Retrospective review - Diagnosis by persistently raised liver enzymes - 39 obese subjects	- Diet and exercise (to achieve 10% weight loss) - Follow-up, 16 months	- Liver enzymes	- Liver enzymes improved by 8% for any 1% weight loss	- Problems in study design (retrospective)
Park[36] (1995)	- Controlled clinical trial - Diagnosis by US - 25 obese subjects (13 lost weight, 12 did not)	- Diet and exercise - Follow-up, 1 year	- Liver enzymes	- Liver enzymes improved in responders, increased in nonresponders	- Problems in study design (no between-group comparison)
Ueno[37] (1997)	- Nonrandomized trial - Diagnosis by US and histology - 25 overweight pts (15 treated, 10 untreated)	- Diet (25 kcal/kg per day) - Exercise (3000 steps/day for 3 days, then increase by 500 steps at 3-day intervals until 10000 steps, then jogging - 20 min bid) - Duration, 3 months	- Liver histology - Liver enzymes - Fasting glucose	- Liver enzymes and glucose improved in treated pts - Steatosis improved in treated pts, unchanged in controls	- Problems in study design (no between-group comparison) - Intervention mainly prescriptive
Kugelmas[38] (2003)	- Randomized trial (lifestyle + vitamin E) - Diagnosis by histology - 16 NASH pts	- Diet (Step 1 AHA diet – low fat) - Exercise (walking or jogging 30 min/day) - Duration, 3 months	- Liver enzymes - Biochemistry - Cytokines	- Liver enzymes and lipid profile improved (no extra effect of vitamin E)	- Intensive behavior intervention (by phone or in person) - Short-term study
Hickman[39] (2004)	- Open-label pilot study - Diagnosis by histology - 31 overweight pts with chronic liver disease (only 3 with supposed NAFLD)	- Low calorie diet (initial 3-month weight reduction period followed by 12-month weight maintenance) - Weekly diet counseling during the initial 3 months - 150 minutes aerobic exercise/week - Duration, 15 months	- Liver enzymes - Insulin resistance - Liver histology (in 14 pts) - HRQL	- Liver enzymes, insulin and HRQL improved in pts who lost weight and maintained weight loss - Fibrosis improved in NASH pts who maintained weight loss	- Intensive behavior intervention - Very limited case series
Suzuki[40] (2005)	- Longitudinal cohort study - Surrogate diagnosis of NAFLD made on alteration of liver enzymes - 348 apparently normal public employees	- Tailored diet (total calories and fat restriction, simplified calorie calculation) - Tailored exercise (20-30 min/day at least 2-3 times per week) - Duration, 12 months; Follow up, 1 year	- Liver enzymes (serum ALT) - US at the beginning and at the end of the study only in few patients	- Maintaining $>$ 5% reduction in body weight strictly associated with maintaining normal ALT	- Problems in study design (no US or histological assessment) - Reinforce of the intervention by a brochure
Huang[41] (2005)	- Prospective pilot study - Diagnosis by liver biopsy - CT scan for abdominal visceral and non-visceral fat - 23 patients (16 completed the study, 15 had a second liver biopsy)	- Promotion of a gradual weight loss - Pts seen by a dietician weekly (first 8 weeks), then biweekly (months 3 to 6), then monthly - Promotion of physical activity (70% of the target heart rate) - Physical activity by questionnaire - Duration, 1 year	- Liver histology (Improvement in NASH score - $\geq$ 1 point, no steatosis) - Insulin Resistance - Liver enzymes - Visceral fat (CT scan)	- Beneficial effects limited to pts who lost $\geq$ 7% of body weight (9/15) - Improved NASH score - Improved liver enzymes - HOMA, triglycerides - 30-70% nonsignificant reduction in visceral fat	- Problems in study design (lack of a control group) - Behavior therapy according to current guidelines
Baba[42] (2006)	- Prospective pilot study - Diagnosis by liver biopsy - 65 patients with NASH (44 completed the study, 15 did not comply with exercise program)	- Moderately energy-restricted diet in obese pts (1-2 pounds/week) - Promotion of physical activity (40 min brisk walking, 3-4 days/week) - Promotion of regular physical activity (60-70% of the target heart rate), 30 min, 5 days/week - Program duration, 6 months - Follow-up, 5.3 months	- Liver enzymes - BMI	- Beneficial effects limited to pts who complied to both dietary and exercise program	- No posttreatment assessment of liver fat - Specific focus on physical activity
Zelber-Sagi[43] (2006)	- Double-blind study (lifestyle + orlistat or placebo) - Diagnosis by US and liver biopsy (40 cases) - 44 NASH pts - 22 had a second biopsy)	- Moderately energy-restricted diet - Promotional of physical activity (40 min brisk walking, 3-4 days/week) - Physical activity by questionnaire - Duration, 6 months	- Liver histology - Liver enzymes	- Improved liver enzymes and BMI in both groups - Additive effects of orlistat on liver enzymes - Fatty liver improved only in the orlistat arm	- Low number of pts who had a second liver biopsy - Additive effects of weight-reducing drugs are expected
Thomas[44] (2006)	- Pilot study - Diagnosis by US (confirmed by histology in 40% of cases) - ^{1}H MRS for total body fat, intrahepatocellular and intramyocellular fat - 10 obese pts	- 500 kcal energy reduction in the diet (typical British diet) - Diet counseling on a weekly basis by a dietician, with fortnightly phone calls between appointments and intensive lifestyle interventions - Walking 10,000 steps/day - Duration, 6 months	- Liver enzymes - Insulin resistance - Total adipose tissue (intra-abdominal and hepatic fat content) measured by MR and ^{1}H MRS	- All patients lost weight - Liver enzymes (not insulin resistance) improved significantly - Total adipose tissue, intra-abdominal and hepatic fat content significantly improved	- Behavior therapy according to current guidelines

Abbreviations: AHA, American Heart Association; BW, body weight; pts, patients; liver enzymes = AST and ALT; HRQL, health-related quality of life; MR, magnetic resonance; ^{1}H MRS, ^{1}H magnetic resonance spectroscopy; CT, computed tomography; US, ultrasound.

Table 3. Strategies to Engage Patients in Lifestyle Modifications

Communicate empathetically
- Counseling is most effective when a patient feels that physicians understand his/her situation, perspective, and feelings.[62]

Evaluate the pros and cons to change
- Counseling physicians should analyze collaboratively the pros and cons of changing patients' eating and activity habits.[65]
- Change is facilitated by a communication strategy to elicit the person's reasons for and the advantages of change.[66]

Examine the variables maintaining the problematic behavior
- Resistance to change should not be opposed with confrontation, but with a collaborative analysis of the problems that favors the unhealthy behavior.[65]
- In resistant patients, physicians should always think contextually (such as, "What are the reasons for this behavior") and functionally (such as, "What are the consequences of this behavior).[67]

Support self-efficacy
- Self-efficacy refers to a person's belief that he/she is capable of keeping a specific behavior;[68] it plays an important role in achieving health behavior change.[69]
- Initially, self-efficacy is promoted by raising the hope that lifestyle changes can be attained.
- During the program, self-efficacy is promoted by designing an individualized program of eating and physical activity that patients are confident to attain.[16]

Be sensitive to stigma against obese individuals
- Stigma has a negative impact on obese patients' health care experiences and influences their decision to start treatment.[62]
- To reduce stigma, physicians should recognize that obesity is a medical condition not the product of lack of willpower, and treat obese patients with respect and support.[62]

Explain treatment
- The aims, duration, organization procedures and results of lifestyle modification should be detailed using written materials, in order to strengthen the commitments to treatment.[52]
- In reluctant patients it might be helpful to propose treatment as a sort of experiment, with a possible return to the old lifestyle habits in the absence of benefits.[70]

carry out lifestyle modification programs? (3) Are they willing to spend a considerable amount of their busy time to treat their patients according to empowerment-based techniques? (4) Are the health authorities of Western countries prepared to reduce the burden of metabolic diseases by implementing correct health policies ?

The following sections are an attempt to answer these questions, describing the main strategies and areas of application of lifestyle modification programs, with indications based on our personal clinical experience on the role of physicians and other health professionals in this area.

Principles of Behavioral Therapy for Lifestyle Modifications

Behavior therapy has been designed to provide patients with a set of principles and techniques to modify their eating and activity habits.[49,50] Initially, the treatment was based on the learning theory (that is, behaviorism). The theory assumed that the behaviors implicated in the development of obesity (excess eating and low exercise) have a strong educational component, and therefore could be modified or relearned.[49] The theory also postulated that positive changes in eating and exercise behaviors can only be achieved by modifying the environmental cues (antecedents) and the reinforcements of these behaviors.[7] The intervention was later integrated with specific recommendations on diet and exercise, and the combination of these 3 components is often referred to as "lifestyle modification".[49] Although most physicians are well aware of the healthy dietary and exercise guidelines to be suggested, a minority receive adequate training to establish effective communication to promote lifestyle change.

Engaging Patients in Lifestyle Modification and Strategies to Increase Adherence. The initial approach varies according to the patients' motivation to change,[51] but in all cases it is essential that physicians adopt an "engaging counseling style" based on the principles of Table 3.

When the patient is engaged, adherence to dietary and exercise guidelines should be favored by clear, easy-to-manage recommendations, tailored on patients' preferences:

(a) *Dietary recommendations*. Lifestyle modification programs recommend a low-calorie diet,[52] whose basic principles are reported in Table 4. Adherence is enhanced by increasing diet structure and limiting food choices, thereby reducing temptation and the potential mistakes on calculating energy intake.[50] An effective strategy to increase the diet structure of the patient is to provide meal plans (that is, grocery lists, menus, and recipes).[50] Support for this strategy comes from a study showing that the provision of both low-calorie food (free of charge or subsidized) and structured meal plans resulted in significantly greater weight loss than a diet with no additional structure.[53]

(b) *Exercise recommendations*. To manage weight loss or to prevent weight gain adults should engage in moderate-to-vigorous exercise for at least 60 minutes on most days (Table 4).[54] Exercise adherence, contrary to dietary adherence, increases with less structure.[50] Patients are

Table 4. Practical Recommendations for Diet and Physical Exercise in Weight Loss Programs

Dietary recommendations[52]
- 1,000 to 1,200 kcal/day for overweight women and 1,200 to 1,600 kcal/day for overweight men and heavier or more active women.
- Diet should provide ≥50% of calories from carbohydrates, ≤ 30% from lipids (7%-10% from saturated fatty acids), and approximately 20% from proteins.
- Total calories should be moderately increased according to the daily amount of physical activity.
- Diets are designed to create a calorie deficit of 500 to 1,000 kcal/day, producing a weight loss of 0.5 to 1.0 kg/week.
Physical exercise recommendations[54]
- Engage in moderate-to-vigorous exercise for at least 60 minutes on most days (at least 5 days per week).
- Walking may be the preferred exercise (unstructured exercise may be included in routine daily activities).
- Check the baseline number of steps by a pedometer, than add 500 steps at 3-day intervals to a target value of 10,000-12,000 steps per day.
- Jogging (20-40 min/day), biking or swimming (45-60 min/day) may replace walking.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.

Note: 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.

keener to engage in physical activity if instructed to do so on their own than if asked to attend on-site, supervised, group-based exercise sessions.[55] Increasing lifestyle activity determines similar weight loss, but greater weight maintenance than structured, programmed activity.[56]

Behavior and Cognitive Strategies

The behavior component of lifestyle modification for weight loss includes the following procedures:[8,50]

Self-Monitoring. Self-monitoring involves the monitoring of food intake, physical activity, and body weight.[57] Patients seeking weight loss underestimate their calorie intake by almost 50%.[58] A key strategy in behavior therapy is to educate patients to improve their estimations of food intake using measurement tools (such as, cups, spoons, food scales), nutrition fact labels, and manuals with the calorie content of food.[50] In a typical food record, patients have to register, immediately after eating, the time, amount, type, and calorie content of foods and beverages they consumed. Patients are also instructed to monitor the type and the amount (in minutes) of programmed activity, and the lifestyle activity with a pedometer, to reach at least 10,000 steps per day.[58] Self-monitoring enhances compliance with dietary and physical activity interventions and favors weight loss.[59] Patients are also encouraged to check their weight regularly,[57] because frequent weight checking is associated with better long-term weight maintenance.[60] Self-monitoring records can also be used to provide information to identify eating and activity contingencies that can be targeted for intervention.[50]

Goal Setting. Patients are encouraged to set specific and quantifiable weekly behavioral goals (for example, eating only on a laid table) and weight goals (losing from 0.5 to 1 kg/week), which should be realistic and moderately challenging.[50] The achievement of these goals is generally associated with a sense of accomplishment, which is reinforcing and enhances self-efficacy.

Stimulus Control. These strategies are based on the principles of classical and operant conditioning. The main focus is to change the external environment by removing negative cues for undesirable behavior (for example, keeping tempting food out of sight or better avoiding buying it) and by increasing positive cues for desirable behavior (for example, putting food records close to the eating table to facilitate its compilation immediately after eating).[50] Stimulus control can also be adopted to reinforce desirable behavior by establishing a reward system (for example, encouraging patients to set weekly behavioral goals and to reward themselves in case of achievement, not through food or inactivity).[50]

*Alternative Behavior*s. This procedure is used to manage nonhunger eating cues (for example, emotional stimuli). Patients are trained to identify these cues and to substitute eating with alternative behaviors (for example, taking a shower, exercising, calling a friend, using relaxation techniques).

Problem Solving. The strategy is used to address problems that hinder weight loss or weight loss maintenance. The typical problem-solving approach includes 5 steps.[61] Step 1 encourages patients to detail the problem and the chain of events (that is, situations) that led to the behavioral problem. Step 2 helps patients brainstorm any possible solution. During step 3, patients generate a list of pros and cons for each potential solution. In step 4, patients 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.

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 to improve adherence to lifestyle programs.[50,62] Cognitive restructuring is used to modify cognitive biases (all-or-nothing thinking) about weight

regulation and to correct unrealistic weight loss expectations, which are associated with higher attrition rates.[63]

Physicians have time constraints, which make it difficult or impossible to allocate to individual patients the time necessary to promote effective lifestyle modification. It is also difficult to recruit a large number of motivated patients to set a group approach, but the Diabetes Prevention Program indicates that individual or group treatment for lifestyle modification can also be provided by trained nonphysician health professionals, such as dieticians, or subjects having masters degree training in exercise physiology, behavioral psychology, or health education.[12]

General Strategies at Population Level to Make Behavior Therapy More Likely to Succeed

Behavior therapy will be more effective if supported by public health programs to change the environment. Efforts should be aimed at reducing population exposure to a NAFLD-promoting environment, at improving the dietary and lifestyle habits of the general population, and making healthy choices easier. Examples include interventions to modify the urban design and favoring physical activity in the community (parks, sidewalks, and bike paths) and at school (physical fitness curricula); increasing the opportunities for family interaction (for example, family gathering at meal time); reducing the exposure of children to marketing of energy-dense, micronutrient-poor foods; and teaching skills for preparing healthy food (implementing nutritional standards for food in school, preschool, and after-school programs; nutritional labeling of food; warning labels on "junk food"; favoring the access of low-income ethnic and social groups to healthy food).[64]

Conclusion

The favorable effects of lifestyle modifications in NAFLD/NASH reported in the very few published trials are largely expected, considering that the disease represents the hepatic component of the metabolic syndrome,[3] where behavioral therapy is definitely useful, and possibly more useful than pharmacologic interventions to avoid progression.[14] It is definitely time to carry out adequate randomized controlled trials of behavior therapy in NAFLD, with histologic analysis as final outcome, to show its potential effectiveness to avoid progression to NASH, liver cirrhosis, and eventually hepatocellular carcinoma. The role of physicians and other health professionals in lifestyle modification needs to be reevaluated, and a "team approach" should be tested. General practitioners, as well as physicians working in gastrointestinal and liver units and treating NAFLD patients, should either receive adequate training in behavioral therapy or limit their intervention to engaging patients. Engaged patients should then be referred to trained lifestyle therapists of diabetes or obesity units (dietitians, psychologists, physical activity supervisors, case managers). They should be given full responsibility for their intervention, working closely with the gastroenterologists and hepatologists to implement full lifestyle modifications. The physicians should periodically monitor the clinical course of liver disease and the associated pharmacological treatment, whenever present, and reinforce the behavioral intervention. Finally, new strategies should be adopted at the population level; only through the synergy of individuals and a global societal response can the maximum benefit for patients with NAFLD be achieved, thus reducing the burden of advanced disease and premature death.

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