CASE STUDY: MOTIVATION, KNOWLEDGE, AND SUPPORT OF THE ENVIRONMENT AS FACTORS OF A SUCCESSFUL WEIGHT LOSS PROGRAM

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Summary

Obesity is one of the biggest public health problems in the world today. The reasons for weight gain in humans are found in the interaction of numerous biological, genetic and psychosocial factors. How to deal with this problem is the subject of numerous studies, and based on the still limited knowledge of weight loss methods, it is concluded that there is no method optimally effective for all individuals. It is considered that the individual approach is one of the best, which is why in this case study the individual approach was first used to monitor the diet and lifestyle of the respondent and then based on the identified irregularities, a weight loss program was developed. The respondent kept a diet diary and a record of life habits for 30 days. 12 critical eating habits and several life habits were identified, which were analyzed in great detail in the first phase of the research. The weight loss program was based on gradual changes in established critical habits, three selected days per week, while on other days the respondent could consume what she wanted. The program lasted six months, had freer access, and was without strict restrictions, which contributed to the high motivation of the respondent for weight loss from the beginning to the end. With the continuous supervision of the program mentor and the support of the environment, the respondent is from the category of obesity III degrees (BMI 40.89 kg/m^2) reduced body weight by 30 kg, and entered the category of overweight persons (BMI 28.49 kg/m^2). A year after the program, she managed to maintain the weight she had achieved. This work confirmed that an individual approach and a gradual change in eating and living habits are effective in the weight loss process.

Keywords: diet, individual approach to weight loss, lifestyle, obesity

Introduction

The problem of obesity today is one of the central problems of humanity, and as things stand for the future too. Nearly two billion people struggle with weight gain, of which 650 million are in the overweight category (WHO, 2020). Obesity is defined as a disease of accumulation of excess adipose tissue to such an extent that it endangers health (Poirier et al., 2011), and its consequences are numerous, from those in the cardiovascular and other systems (Medanić and Pucarin-Cvetković, 2012), to diabetes and various cancers. A consistent association of childhood and adolescent obesity with an increased risk of premature morbidity and mortality, especially cardio-metabolic (Reilly et al., 2010) has been found, the life expectancy of obese people is on average two years shorter (Muennig et al., 2006) and the general health of obese people is usually worse than people of normal weight. In addition, research shows that obese people are very badly affected by public judgment (Puhl and Heuer, 2009) which results in negative feelings towards themselves and the world and creates anxiety, depression, fear and a range of other psychological disorders.

People gain weight for several reasons. It is believed that man today has changed his way of life and in that light the way of eating. It is increasingly easy to accept the choice of ready-made food, bought in a hurry, chooses for a meal something delicious from well-known food chains, and such a diet is rich in energy and weakened by other nutrients (Hall and Kahan, 2018). Less and less is devoted to food choices, meal preparation, family, and without physical activity, the problem becomes the intake of more energy than the body needs and/or is consumed during the day and a person gains weight. The causes of weight gain are multiple and complex and involve the interaction of several biological, genetic, and psychosocial factors (Wyatt et al., 2006), so treatment (weight loss) is equally complex. The problem of weight loss should therefore be approached very carefully because weight loss requires not only a change in diet but also a behavior change. It requires patience, time, physical activity, and knowledge, not only about weight loss methods but also about the fact that the wrong approach to weight loss can lead to complications and problems. For example, a long-term diet high in protein can cause ketoacidosis, kidney and liver disease, and decreased bone density (Štimac and Turk, 2008). A big problem is the well-researched Yo-yo effect in which after losing a diet, you lose weight in a short time, but return quickly over time. The increased urge to eat after losing weight lasts for more than a year is several times stronger than adapting to a new

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condition, and is potentially a major driver of weight gain (Polidori et al., 2016). As a result, only about 20% of obese people preserve and stabilize the weight loss effect in the long run (Wing and Hill, 2001). When losing weight, one should also consider the will factor or motivation of the individual to lose weight, which is initially high, and then usually decreases. This begs the question of whether the willpower to continue limiting food intake weakens or the body physiologically defends genetically based weight? Mann (2018) believes that the answer lies somewhere in between because reduced calorie intake during weight loss leads to changes in hormones, metabolism, and cognitive functions that make it difficult to behave to maintain the weight achieved by the diet. What is certain is that numerous studies confirm the return of kilograms (Wu et al., 2009), more than half recover most of the lost kilograms in the first 12 months.

There are also many misconceptions, beliefs, and prejudices that Jelčić (2014) believes have become so embodied that they have become stereotypes, for example, that obesity is a dietary disease, that obese people eat huge amounts of food, that small changes in energy intake cause big changes body weight over a long period, and this does not happen because there is an adjustment of basal metabolism to changes in body weight. Also, tips and various diets that come from the professional literature, but also websites, advertisements, or weight loss products, cannot be counted and they create even greater confusion in obese people. What to do in the sea of this information? To begin with, it is important to know, and this is what most authors agree, that obesity is a lifestyle disease caused by the interaction of genes and the environment, and that lifestyle changes are possible, but long-lasting because a person changing must get used to new patterns of behavior, new routines, and habits, and the body must get used to the new bodyweight. Also, most authors agree and these claims have their basis in science, that change in the diet is needed, ie reduce excessive energy intake, improve the quality of nutrition and increase energy consumption (Raynor and Champagne, 2016). How, which diet to choose, is the next question?

When choosing a weight loss method, it is necessary to first seek the advice of an expert. It is then necessary to separate medical from therapeutic diets and distinguish them from popular or commercial diets. Know which of the popular diets are accompanied by scientific evidence, and where are they missing? In this context, Freire (2020) classifies a diet into three main categories and provides scientific evidence that they are applicable as dietary strategies for weight loss. The first group are diets based on the manipulation of macronutrient content, they are a diet low in fat, high in protein, and low in carbohydrates, and among them are the popular diet Atkins, Ketogenic, Zone, Ornish, Paleo. The second group are diets based on the restriction of specific foods or food groups (gluten-free, Paleo, vegetarian/vegan, Mediterranean) and the third group is diets based on the manipulation of timing (abstinence from food and drink for some time with modification with a normal diet, ie fasting). Numerous other weight loss methods have been described in the literature such as low-glycemic, balanced, DASH, DPP, Weight Watchers, South Beach, blood type diet (Katz and Meller, 2014), some based on medical, some on an alternative approach, and each of them has its advantages and disadvantages. Medical ones are evidence-based and aim to lose 5 to 10% of body weight over six months while maintaining the achieved body weight for at least two years (Anjali, 2005), alternatives are often not sufficiently explored.

Unfortunately, there is no convincing evidence of which is the best, as there is not enough research to confirm this, but the authors agree that diet should be implemented, not to lose weight, but to achieve good health (Tomiyama et al., 2013; Katz and Meller, 2014) and that there is no optimally effective diet applicable to all individuals. For weight loss, the key to success is a prudent combination of all these approaches in the context of a healthy and balanced diet without serious restrictions or dietary exaggerations and it is best to approach it on an individual basis, with a diet plan based on individual characteristics (Koliaki et al., 2018). Finally, the fundamental thing is to adopt a diet with a negative energy balance, focus on achieving good health with proper nutrition from the guidelines, and with mandatory physical activity, this will ensure long-term success.

Thus, the path to a theoretically designed and practically feasible diet is demanding and complex. Taking this into account, as well as the knowledge about weight loss presented in the introductory part of the paper, this case study presents an example of an individual approach to a weight loss of a 22-year-old girl who has been obese since childhood and was in stage III obesity. The paper aims to emphasize that good preparation for a weight loss program, detailed assessment of improper lifestyle and eating habits, knowledge of improper diet and the consequences of such a lifestyle, and monitoring of a weight loss program are the factors that most strongly influenced the firm decision and emotions to persevere weight loss program as well as maintaining weight after a weight loss program.

Materials and methods

The respondent (Eli) is a 22-year-old girl, a former student of the Department of Food Technology at the

Biotechnical Faculty of the University of Bihać, who has been suffering from obesity since childhood. Interviews with a potential mentor for bachelor's work begin in the spring of 2019 after passing the module Nutrition Science, where she showed extraordinary knowledge and interest in the issues that the module deals with. From April to July 2019, through about 10 consultative meetings to discuss lifestyle and diet, the effects of her obesity on quality of life in general. During the conversation, Eli shows strong motives and desire to lose weight, but she doesn't succeed. She admits that because of her obesity she is very unhappy and insecure. The decision to follow the diet and lifestyle through the development of a bachelor's work and to implement a weight loss program was discussed. It was agreed that Eli would think carefully, study the prepared literature during the summer vacation, and make a decision. At the beginning of September 2019, Eli decided to start the weight loss process with the mentorship of professors and researchers in the field of nutrition.

A plan for making a bachelor paper consisting of three phases was designed. In the first phase, body mass index (BMI), quality of diet, eating habits, and some lifestyle habits were determined and monitored in detail for 30 days (November 1 - November 30, 2019). Preparations lasted 30 days, and the processing of monitoring results took a month and a half. The second phase consisted of the gradual introduction of changes in daily routine and habits, those identified as critical in the first 30 days of the study, lasting six months (15 January - 15 July 2020). The third phase consisted of processing the obtained data, writing and defending the bachelor's thesis, and continuous monitoring of the achieved body weight until the ascertainment of the condition on 15 July 2021 (one year after the weight loss program).

To monitor the selected parameters, a questionnaire was developed combined using the methods proposed by Šatalić (2013), Biro et al. (2002), and Šatalić and Alebić (2008). A food diary was kept in which the time, place, types, and quantities of food and beverages consumed distributed during working days and weekends were entered. Quantification of ingested food was expressed in serving units (small, medium, or large portion) by a combination of the FFQ method and data from the CapNatura (2014) food catalog or labeling from the packaging. Data on daily intake of total energy, energy from proteins, carbohydrates, and fats were calculated using tables on the composition of food and beverages (Kaić - Rak and Antonić, 1990) and other available tables. The number of meals at breakfast, lunch, dinner, and snacks was recorded, and meal times were taken from AHA recommendations (St-Onge et al., 2017). To assess nutritional status, anthropometric measurements (body weight and height, waist circumference, hips, upper arms, forearms, and thighs) were performed with an ordinary house scale and an ordinary tailor's meter, and were measured every five days during the second phase and periodically in the third. In the second phase, the amount of blood sugar (ACCU-CHEK Performa apparatus) and pressure (Boso Medicus uno apparatus) were measured every 10 days. Lifestyle habits were monitored by records of the following parameters: time of getting up, time of first and last meal, time of sleep, daily sitting, all daily activities (housework, moderate and intense physical activity, walking, social life).

Results and discussion

From the diet diary that Eli kept for 30 days, several wrong eating habits were identified (Figure 1). The first is that she consumed a total of 252 meals, which is an average of 8.1 meals on working days and 9.4 meals on weekends (daily range from 4 to 14). This is not a bad habit, as several studies have found that more daily meals reduce the risk of cardiovascular disease (CVD) and diabetes (Cahill et al., 2013), but the distribution of meals during the day was critical because 30% of all meals consumed after 7 p.m. (i.e. at night before bedtime). Eating food late at night, within two hours of going to bed increases the risk of CVD, according to St-Onge et al. (2017) who in addition to investigating how the number of meals and the time of their consumption affects health investigate the impact of skipping breakfast and occasional fasting by reviewing over 120 epidemiological and clinical studies. They mention research with medical workers in the night and day shifts, where it was shown that people who work in the night shift have increased blood sugar, cholesterol, and triglyceride levels, as well as an increased heart rhythm disorder, but they recommend additional research for night work because there is not enough evidence of an adverse effect. They report that a regular breakfast can reduce the risk of adverse effects associated with glucose and insulin metabolism and that there is a link between skipping breakfast and obesity, but breakfast has a limited effect on weight loss, probably because people eat many times a day, and calorie intake and food selection have a greater impact on weight than breakfast alone. It is best to have breakfast an hour after getting up, as this prevents fatigue, the body gets the energy it needs, but it is necessary to avoid foods rich in sugar and gluten like croissants and too many caffeinated beverages, which is the case with Eli. Also, daily and periodic fasting can be effective in losing weight, maintaining weight

after weight loss, lowering triglycerides and blood pressure, but not lowering cholesterol or glucose. Despite insufficient evidence on some topics, St-Onge ultimately concludes that the dietary styles studied may have different effects on cardiometabolic health markers and that recommendations to eat like a king for breakfast, like a queen for lunch, and like a poor man for dinner find their place in science. They add that meals should be taken from the morning from 6.00 a.m. to 6.00 p.m. maximum, noting that it is very difficult to separate when it is time for a meal, due to snacks and the habit of people to constantly "snack on something along the way". According to the AHA recommendations (American Heart Association), breakfast time is from 5 to 10 a.m., lunchtime from 12 to 1 p.m., dinner time from 5 to 7 p.m., while the time of the first, second, and third snacks is calculated from 10 to 12 / 1 to 5 / from 7 p.m. onwards. All other critical eating habits identified in Phase I of this study are presented below:

- High concentration of meals after 7 p.m. until no later than 11:40 p.m., 1-6 meals (average 2.1 working days, 3.3 weekends), 13 / 30 days consume whole meals (appetizer, meal, dessert), 18 / 30 times sweets.
- High concentration of meals at breakfast time, breakfast from 7:30 to 10 a.m., 1-4 meals (average 1.6 working days, 1.0 weekends), breakfast 26 / 30 days, breakfast composition extremely poor, 20 /30 days consuming sweets.
- Extremely a lot of industrial sweets (chocolates, biscuits), 29 / days consumes sweets.

- Extremely a lot of fast food (various pies, hamburgers, hot dogs, french fries), 17 / 30 days.
- Extremely a lot of sugar with Nescafe (2 tablespoons), 23 / 30 days consumed Nescafe.
- Extremely breaded and baked, from 25 meals at home / 19 breaded or baked.
- Add cream, mayonnaise, or ketchup to each dish.
- All side dishes are potatoes, pasta, rice, only once frozen vegetables.
- Extremely few fruits and vegetables, consume bananas and citrus for 8 / 30 days, only one salad.
- Extremely little cooked food, only 6 / 30 days.
- Frequent consumption of snacks and Coca-Cola, 11 / 30 days.
- Little water (average 1.1 L on working days and 1.26 L on weekends)

The results with specific numbers caused fear and concern in Eli, and the tables that visualized irregularities in the colors caused a strong motivating effect. One of the tables (Figure 1) has been adapted for this work, which shows the daily distribution of meals according to the type of food and beverages consumed. Black to gray shades represent various undesirable food groups, the visual texture shows the desired food groups, while the hours when she did not consume anything are white. In the original color chart, when Eli saw how black the blackboard was, she blackened before her eyes and stated to herself, "Well, this is terrible!"
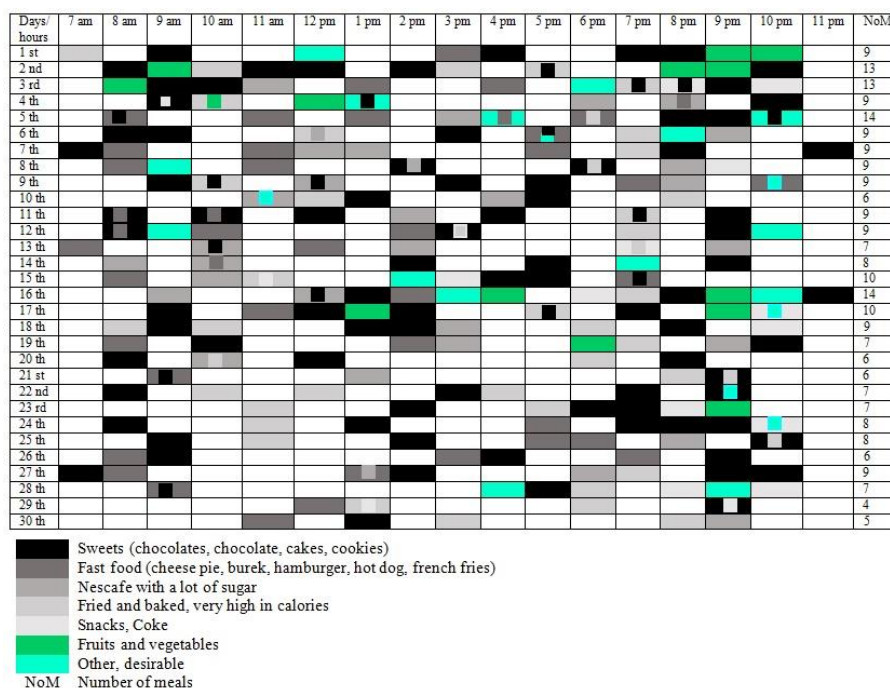

Figure 1. Daily distribution of meals, according to the time and type of food

Of the undesirable lifestyle habits, sitting was the most critical. On working days, Eli was awake for an average of 15.55 hours, of which 73% of the time she sat, on weekends 72%, the longest through hanging out with friends outside. With various screens, she spent an average of 5.05 hours, on weekends 6.58 hours. A comparison with the data on the average daily seating for 63 countries presented by the WHO in 2015 (from 2.12 to 9.47 hours) found that Eli sits more than this range. Given that research shows that long sitting is associated with several health problems (obesity, high blood pressure, high blood sugar, excess body fat around the waist, and abnormal cholesterol levels) and that there is an increased risk of death from CVD and cancer (Mclaughlin et al., 2020) it can be concluded that sitting hours with Eli are one of the riskiest lifestyle factors for her health. In addition, there is no physical activity, except for the average daily walking (3.9 km) and housework (1.10 h), as well as social activities (activism, volunteerism, membership in organizations, no contact with nature).

After the results were determined in the first phase of the research, it was agreed to start phase II from January 15, 2019. Until then, Eli had lived entirely by old habits, studied the literature, and was visibly concerned about her habits. Phase II begins with a gradual change in established critical habits. One day without meat (Monday), a day without sweets (Thursday), and a day of proper nutrition (Saturday) are introduced, and for other days Eli is left with the option to eat as she wishes. The diet diary was kept only for these three selected days. One hour of brisk walking is introduced, at least three times a week. The first evaluation was done after two weeks, and it was found that Eli fully complied with the instructions, but on her own initiative excluded from the diet all types of sweets and all types of fast food. He introduces salads, cooked dishes, and keeps fried chicken dishes into his diet. Reduce the number of meals to 3-4,

at the recommended mealtime. In the evening, she introduces green tea with a teaspoon of honey, changes her Nescafe with tea on outings, consumes fruit in 7 / 15 days, an apple that she has never consumed, throws out a banana, previously the most commonly consumed fruit. The result was motivating, a loss of 7.15 kg. There were no changes in the biochemical monitored parameters. However, she was warned to reduce the intensity. In the next two weeks, he loses an additional 2.6 kg and retains the acquired habits. He keeps a diet diary for a full six months, gradually giving up old ones, introducing new habits. An evaluation with a mentor was done every 15 days. The achieved changes are shown in Table 1.

On average, the number of meals was reduced from 252 to 142 per month, all industrial sweets, snacks, Nescafe, and Coca-Cola were excluded. In the evening, 90% of meals are fruits and vegetables and tea with honey, generally reducing the share of evening meals from 30% to 23%. She keeps a high proportion of breaded and roasted meat, because she loves these meals, and it was agreed that the changes be introduced in three selected days so it does not create psychological pressure. Increases water consumption from an average of 1.2 L to 2.0 L.

The results on the average daily energy intake, and the ratio of energy obtained from proteins, carbohydrates, and fats for phase I and phase II, but only for one month (penultimate) are shown in Table 2. About her calculated energy needs (1.893 kcal), Eli consumed on average 22% more energy than needed, and in addition, according to the recommendations to consume 55-75% of energy from carbohydrates, 15-30% from fat, and 10-15% from protein (Šatalić, 2008), obviously ingested excess fat. Later in the weight loss phase, she ingests 47% less energy than needed, reduces her energy intake from fat by 10%, but increases her protein intake more than recommended, as she was warned.

Table 1. Share (%) of intake of main food groups counted as meals by phases

Grocery groups	Phase I (30 days) (252 meals)		Phase II (77 days) (426 meals)	
	NoM*	%	NoM	%
Undesirable				
All sweets, chocolates, chocolate, cakes, cookies	95	37.7	0	0
Fast food (pies, hamburger, hot dog, french fries)	50	19.8	16	3.8
Nescafe with a lot of sugar	32	12.7	0	0
Breaded, baked	19	7.5	33	7.8
Snacks: chips, figs	12	4.8	0	0
Coca Cola	9	3.6	0	0
Desirable				
Fruits and vegetables	11	4.4	171	40.1
Cooked food (beans and soup) and soups	6	2.4	61	14.3
Yogurts, milk, and cereals	2	0.8	30	7.0
Honey	2	0.8	20	4.7
Water, average (L)		1.1-1.3		1.5-2.5
Total number of main meals	238		331	

*NoM: Number of meals

Table 2. Comparison of energy intake in the first month of research (phase I) with energy intake in the penultimate month of research (phase II) for selected days

Selected days	Phase I				Phase II			
	Total energy (kcal)	Proteins* (%)	CH* (%)	Fats* (%)	Total energy (kcal)	Proteins* (%)	CH* (%)	Fats* (%)
Saturday	2.576	14.10	42.12	43.77	850	17.20	59.20	23.60
Monday	2.324	14.23	51.61	34.16	1.107	15.29	62.62	22.00
Thursday	2.011	13.46	55.10	31.44	1.072	29.64	37.31	33.72
Mean	2.304	13.93	49.61	36.46	1.010	20.71	53.04	26.44

Part of energy (%) coming from proteins, carbohydrates (CH), and fats

Based on body height (163 cm) and age (22 years) in the first phase, using the Harris-Benedict equation (Šatalić, 2008), the ideal body weight (58.3 kg) and BMI of 40.85 kg/m^2 were calculated. Eli was 50 kg overweight and according to BMI entered grade III obesity or morbid obesity. After a six-month weight loss program and a loss of 32.95 kg, the calculated BMI was 28.49 kg/m^2, according to which Eli entered the category of overweight people. Significant changes in lifestyle habits were reflected in the introduction of more physical activities, she increased the average daily walking to 4.9 km on working days and 4.66 km on weekends, acquired a stepper on which she exercised 30 minutes every day, and cycled 45 minutes, three times in a week. In her case, the Covid 19 pandemic had a positive impact on acquiring new habits as Eli spent time with family doing housework and farm chores. The results of monitoring anthropological and biochemical parameters showed that Eli lost the most pounds in the first month (9.75 kg) and that each subsequent month weight loss decreased along with calming the euphoria she had with success in the first month of weight loss. The largest decrease in anthropological parameters was achieved in the waist (24 cm) and hips (23 cm). Biochemical parameters pressure (highest 124 / lowest 70 mmHg) and blood sugar (range 4.7-5.0 mmol/L) were measured every 5 days and were within normal limits at all times.

In the third phase, while Eli was writing her bachelor's work, she continued with her newly acquired eating and living habits. Half of the III phase (15th of January 2021) Eli further reduced her body weight to 70.0 kg, exactly after one year on 15th of July 2021, she further reduced her weight to 69.5 kg.

Finally, as key factors in the success of a weight loss program can be singled out the factor of will or motivation of the respondent, which was high from beginning to end. Researchers claim that the will weakens during dieting, people give up and cannot keep the lost weight because physiological changes occur in the body, which makes it harder for the willpower needed to maintain the achieved weight. It is concluded that the motivation of the respondent Eli was influenced by freer access to change, without strict restrictions, mentoring,

and practically daily supervision of the weight loss process. Eli felt safe and listened to the instructions very conscientiously. However, the most important factor, and this is the key difference between this and other known methods for weight loss, emphasizes the obligation of the respondent to learn and acquire knowledge about the principles of weight loss, the principles of proper nutrition, and the effects of obesity on health. As one of the most important elements of the program, the influence of a detailed analysis of habits in the first phase of research and visual graphic representations (table, Figure 1) on the psychological state of the program is highlighted. The knowledge of "blackness" and the dominance of undesirable habits (the tables were mostly black) and of the possible disastrous health consequences for her future life, was a strong motive in this case. Therefore, the authors conclude that the first phase in this research (i.e. the precise identification of undesirable habits) significantly contributed to the weight loss program. This approach of very detailed analysis of negative habits and their visualization is an innovative contribution to all hitherto known methods of weight loss. And finally, this study shows that it is possible to lose weight without excessive denial of certain foods, but it is necessary to change habits with a completely individual approach. The main disadvantage of diets is that they are too restrictive, too demanding, non-individualized, and thus unsustainable. An individual approach to weight loss based on precisely identified irregular lifestyle and eating habits that Torrado et al. (2015) claim are the main causes of negative energy balance and overweight, and the gradual introduction of changes through a combination of recommendations from numerous authors resulted in success in Eli.

Conclusions

In this paper, a strictly individual approach to weight loss and lifestyle change was applied and as such brought excellent results in both diet and behavior. The weight loss method is combined with the recommendations of numerous authors who claim that

lifestyle and poor eating habits are the main causes of weight gain. In a person entering a weight loss program, it is important to make them aware of their undesirable habits and increase their knowledge about the consequences of improper diet and bad habits, and this can be done by a very detailed analysis of these bad habits. Weight loss is indeed a long-term process, requiring great will, motivation, as well as the support of family and the environment, and this paper confirmed that an individual approach and gradual change of eating and living habits are effective methods for weight loss.

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