A multidisciplinary lifestyle intervention for childhood obesity : effects on body composition, exercise tolerance, quality of life and gut hormones

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Chapter 7

General Discussion

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The general aim of the studies described in this thesis was the effect evaluation of a family-based multidisciplinary cognitive behavioral treatment on several domains related to childhood obesity compared to standard care. The primary outcome parameters were the treatment effect on total obesity (BMI-SDS) and abdominal obesity (WC-SDS). Other domains of interest were the effect of the above-mentioned treatment on glucose homeostasis, inflammatory state, secretion of gastrointestinal hormones involved in food regulation, physical fitness and Health Related Quality of Life (HRQOL). Furthermore, we aimed to evaluate the effect of the metabolic consequences of childhood obesity on increased health risk in terms of insulin resistance. In this chapter the results of these studies will be considered in a broader perspective. First the main findings of these studies will be reviewed in relation to the literature. Next, possible causes for the modest weight reduction after lifestyle interventions in the obese children will be discussed. Subsequently, the predictive value of impaired anthropometric and metabolic variables on future health risk will be addressed. This chapter will conclude with a discussion on clinical relevance and future research perspectives.

RESULTS OF MULTIDISCIPLINARY COGNITIVE BEHAVIORAL TREATMENT OF OBESE CHILDREN

Childhood obesity is a worldwide expanding problem and now poses one of the greatest public health challenges for the next decades, along with its associated co-morbidities. In the battle against childhood obesity behavioral lifestyle interventions, combined with parental involvement, are preferred over standard care or self-help (1). The results of behavioral lifestyle interventions on obesity and associated co-morbidities are promising (2-7), however, the intermediate and long-term follow-up effects are uncertain (8;9).

The results discussed in chapter 3 show a positive short-term (3 months), intermediate (1 year follow-up) and long-term (2 years follow-up) treatment effect on total obesity (BMI-SDS) as well as abdominal obesity (WC-SDS). This latter finding is of special importance, since it has previously been reported that health risk is increased by the combination of increased BMI-SDS alone and a WC > 90th percentile for age and gender, rather than by an increased BMI-SDS *per se* (10). In the same chapter we also showed that weight reduction after lifestyle treatment improved physical fitness, while a constant degree of obesity, as found in our obese control group, was associated with a significantly decreased physical fitness. This finding of an improved physical fitness in our intervention group is not only important for their health status, but also for their psychological wellbeing.

In chapter 5 we showed that obese children experience a lower HRQOL especially for the domains related to physical fitness and self-perception, as was reported previously (11-14). It is important to mention that, although obese children significantly reduce their adiposity after lifestyle treatment, they remain on average still obese. In view of this, findings like a reduced WC-SDS, improved physical fitness and better HRQOL after modest weight loss are important. Measurement of waist circumference, a simple test for physical fitness and the completion of a short HRQOL questionnaire during follow-up visits of obese children and their family after treatment could be motivating and helpful tools, both for pediatricians and general practitioners.

In addition, although modest weight reduction by lifestyle intervention slightly elevates ghrelin levels, as shown in chapter 4, it did not affect PYY or GLP-1 concentrations. Also the increased inflammatory state in the obese children compared to normal peers was not significantly altered after lifestyle treatment in our study (chapter 3), while others did find a significant treatment effect (7;15). It is therefore conceivable that a more substantial average weight reduction of ≥ 0.5 BMI-SDS would have had a more pronounced effect on gut hormone concentrations and inflammatory state.

POSSIBLE CAUSES OF MODEST RESULTS OF LIFESTYLE INTERVENTIONS

It is known that numerous factors contribute to obesity, including genetic, environmental, biochemical, psychological and physiological factors. This complex multi-factorial causality underlying childhood adiposity, makes it unlikely that a single treatment will be successful for all children with obesity. Also, the socio-economic status and ethnic diversity should be taken into consideration in future attempts to improve the treatment of childhood obesity. To improve long-term follow-up results, it may be considered to offer treated pre-pubertal children a modified lifestyle intervention again, once they enter puberty.

Besides modest weight reduction as a result of multidisciplinary lifestyle interventions, another known problem in this kind of weight reduction treatment programs is the high dropout rate during treatment and follow-up (8). In our study repeated booster sessions were scheduled during the whole follow-up period of 2 years, but we also found decreasing adherence of the participants over time, with the highest dropout rate during the first 12 months (8 children). In the second year of the intervention only one additional child was lost to follow-up. To overcome this problem, an increased frequency of booster sessions, such as every other month during the first year and 3 additional ones during the second year of follow-up might be beneficial, partly because of the effect of social peer pressure in the treatment groups. Also frequent email communication and an attractive interactive website where children can ask questions answered by health professionals and chat with their obese peers might be helpful.

In spite of these additional strategies to improve treatment results by motivating obese children to change their lifestyle, the real problem lays in the difficulty to change the environment of these children. Historically, a fat child meant a healthy child, one who was likely to survive the rigors of undernourishment and infections (16). Moreover, people had to deal with fluctuating food availability during the year and from year to year. In this light it was beneficial to evolve a mechanism to protect man from extinction during long periods of hunger. In addition, human energy regulating systems are extraordinarily precise under normal conditions and a positive energy balance of only 120 kcal per day will produce a 50 kg increase in body weight over a period of 10 years (16). Thus, any factor that raises energy intake or decreases energy expenditure by even a small amount will cause obesity in the long-term (16). In today's society of industrialized countries, not only energy intake has increased, but also food is always available without periods of shortage. Furthermore, a sedentary lifestyle has become more common. In view of this, the rapidly increasing prevalence rates of childhood obesity in a genetically stable population during the last few decades, can be largely attributed to adverse environmental factors in combination with an evolutionary conserved tendency to favor obesity. It is, therefore, unrealistically optimistic to expect that the battle against childhood obesity can be won without fundamental changes in social environment.

EFFECT OF CHILDHOOD OBESITY ON ADULT HEALTH

Childhood obesity is of particular interest, because of possible long-term associations with adult overweight and subsequently associated morbidity. There is strong evidence that obesity during childhood increases the risk of obesity during adulthood considerably (17). In addition, a large population based cohort study found that higher childhood (7-13 years) BMI values elevated the risk of developing coronary heart disease (CHD) in adulthood (≥ 25 years) (18). Furthermore, in chapter 6 we showed that increased WC-SDS and FG-SDS were significant predictors for increased HOMA-IR SDS. So, unless aggressive new treatment modalities will be developed to change obesity trends, present-day childhood obesity will have a substantial effect on public health, reaching far into the future.

The CHD Policy Model, in which the prevalence of 35-year-old obese adults in 2020 is estimated, is used to predict that the present epidemic of adolescent obesity in the United States will substantially increase future rates of adult CHD (19). In addition, there is already evidence that recent North American birth cohorts not only are becoming obese in greater number at a given age, but also earlier in their life course compared to the birth cohorts from the previous decades (20). Consequently this will lead to a greater cumulative exposure to excess weight over their lifetime, which will, most likely, have profound implications for future rates of obesity related co-morbidity (20). It is conceivable that a similar trend will occur in other western countries, dealing with an increased prevalence rate of childhood obesity during the last few decades. Importantly, the majority of overweight and obese adults in our time did not have overweight as a child. Therefore, the adult health risk profile of today's overweight youth might be different from that of earlier generations.

The epidemic proportions of childhood obesity support the idea of a population-based preventive approach. It is important to study, from a population-based view, the impact of lifestyle interventions on all children with obesity participating in these intervention and not only on those who complete the lifestyle intervention.

FUTURE PERSPECTIVES

The prevalence of obesity among children has been increasing since the 1980's, with little indication of a decrease or reversal of this trend (21). This has led to the prediction that today's generation of children may be the first for whom life expectancy falls (22). Although the knowledge of childhood obesity and its health consequences increases every year, many questions concerning best preventive and treatment possibilities remain still open. Preventing and treating childhood obesity has proven to be challenging and treatment options include lifestyle interventions (with or without psychological strategies), as well as pharmaceutical interventions and bariatric surgery (23). In general, the latter two treatment options are restricted to obese adolescents.

With today's knowledge, behavioral lifestyle interventions seem to be the preferred treatment strategy for obese children. Although most trials studying the effect of such interventions on childhood obesity show modest weight reducing results, the effect is statistically significant and clinically meaningful in reducing obesity and associated co-morbidity (1). In severely obese adolescents with obesity related co-morbidities, a more intensive weight loss therapy might be appropriate.

In a recent systematic review the role of pharmacotherapy in the treatment of childhood obesity was described, based on a meta-analysis (24). The pooled effect of both Sibutramine and Orlistat lead to a significant reduction in BMI of 2.4 kg/m^2 (CI 1.8, 3.1 kg/m^2) and 0.7 kg/m^2 (CI 0.3,1.2 kg/m^2), respectively, compared to placebo over 12 months (24). However, Sibutramine is no longer an option for young people with obesity in Europe as the license has been withdrawn because of cardiovascular safety concerns regarding its use in the adult population, although it still has a restricted license for use in the United States (25). Moreover, most drugs do not produce permanent changes in physiology or behavior, raising the prospect of life-long treatment (25). In addition, treatment effects of registered anti-obesity medication on weight reduction are modest as well (24). Taken together, adding medication as an adjunct to the lifestyle intervention can be considered, but this approach needs to be carefully weighted against the potential adverse effects (1).

Also the decision to advise bariatric surgery in obese adolescents should be taken with care. It can only be considered if intensive lifestyle interventions, possibly in combination with anti-obesity medication, have failed. In general, the laparoscopic adjusted gastric banding (LAGB) or Roux-en-Y gastric bypass (RYGB) lead to substantial weight loss in adults (26). Reliable data in obese adolescents on the effect of such procedures on weight reduction and the severity of side effects and complications of the procedures are lacking. Evidence so far is based on clinical observations. Short-term benefit of surgery in severely obese adolescent has been shown, but long-term follow-up data are sparse (25). Adverse events reported after surgery range from mild malnutrition to more severe complications, including severe malnutrition, gastrointestinal bleeding, and gastrointestinal obstruction (26). Therefore, in view of present knowledge, the surgical approach should be considered as a last resort for severely obese adolescents (27).

Future longitudinal research has to focus mainly on which child will benefit from which kind of intervention to develop specific individualized therapies, as well as straightforward changes of social environment by the government and local authorities in order to "detoxify" it. Meanwhile it is advised to try to motivate obese children to change their lifestyle and eating pattern, with the help of a dietician. Assessment of WC, physical fitness and HRQOL will assist the health professionals to achieve a better insight in the development of health risk of the obese child and may motivate the obese child and family during treatment.

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