

Chapter 8

General discussion



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Introduction

This thesis describes the effectiveness of a multidisciplinary group treatment Go4it in obese adolescents (11-18 years). Go4it aims to prevent the development of diabetes mellitus type 2 by improving dietary behaviour, physical activity and sedentary behaviour among obese adolescents. This chapter summarizes the study results that are presented in this thesis. In addition, the results and methodological considerations will be discussed, and future recommendations for research and clinical practice will be provided.

Summary of main findings

Effectiveness of Go4it

At 18 months follow-up, the Go4it group had a mean decrease of 2 kg in comparison with the control group. None of the other body composition or metabolic components showed significant treatment effects. Western adolescents benefited most from Go4it, besides BMI_{sds} also Systolic BP, Diastolic BP and HDL improved significantly at 18 months follow-up. Among adolescents who complied well (attended ≥ 5 of the 7 Go4it sessions) a significant intervention effect on BMI_{sds}, waist circumference and HDL was found at 18 months follow-up (Chapter 3). In addition small but beneficial intervention effects on quality of life (assessed by PedsQL™4.0 and BES) were found. Two subscales of the PedsQL™4.0, namely physical health and school functioning, improved significantly in favour of the intervention group (Chapter 4).

Compliance

Compliance was a big challenge. Of the adolescents assigned to the intervention group, 59% attended at least 5 of the 7 Go4it sessions. Reasons for not attending the Go4it sessions included: lack of motivation to change dietary habits, lack of belief of parents in their child's possible success to lose weight, previous unsuccessful dieting experiences, travel distance and the limited time of working parents and schoolchildren. Seventy-two percent of the parents attended the first parent session and 55% the second. The control group received regular care, which was referral to a dietician. At 6 months follow-up 48% of the control group had never visited a dietician, n=4 visited a dietician once, n=6 went twice, n=7 went 3 or more times, and for 6 participants it is unknown. The main reason for noncompliance was lack of motivation because of previous unsuccessful dieting experiences with or without a dietician (Chapter 3).

Behavioural and social-emotional functioning

Our sample of obese adolescents experienced serious behaviour problems and social-emotional malfunctioning, which was confirmed by their parents. Mean YSR and CBCL scores for total and all subscales were significantly higher than the reference group, except for the Externalizing scale of the YSR. Parents reported more problems than their children on all scales. There were no significant differences between western and non-western adolescents, except for the attention problem score (Chapter 2).

Tools for estimation of energy needs and fat-free mass

Prediction of resting energy expenditure (REE) in obese adolescents based on equations is subject to significant errors. An adequate prediction equation thus far, accurately predicted the REE in only 74% of obese adolescents. The often-used Schofield-weight (10-18 years) equation (1) accurately predicted the REE in only 50% of obese adolescents. For this reason, indirect calorimetry remains the method of choice for accurate assessment of REE in obese adolescents (Chapter 5). For the assessment of fat-free mass (FFM) with BIA, the Gray-FFM equation appears to be most adequate, with accurately predicted FFM in 63% of obese adolescents. However, 63% is still not at an acceptable accuracy level. Thus, DXA measurement remains the method of choice for FFM in obese adolescents between 11-18 years (Chapter 6).

Methodological concerns

Participants

Inclusion criteria for participating in the trial were: 11-18 years, overweight or obese, no diabetes mellitus, no syndromes and speaking Dutch. We asked all the eligible adolescents and their parents visiting our outpatient ward to participate. We achieved a participation rate of 65% among adolescents. For several reasons, 67 adolescents chose not to participate. Participants and nonparticipants were similar according to ethnicity, weight and BMI at the first appointment.

Go4it was more effective in adolescents of western ethnicity (2). Thus, Go4it needs further adaptation to the non-western target group. Potential explanations for the differences between western and non-western adolescents are that parents from Turkish or Moroccan descent may underestimate the actual weight status of their children as well as the importance of a healthy weight (3,4). Kocken et al. showed that the Turkish parents more often believed that genetic factors cause overweight than Dutch parents. Although overweight and obesity were 3 times as high in the children of Turkish descent, parental beliefs in Turkish parents about overweight prevention and management did not reflect a sense of urgency about changes in their child's behaviour (5). Besides this, children of non-western ethnicity are generally less physically active than

adolescents of western ethnicity (6,7). Parental recognition and acknowledgement of their child's weight are critical steps in the success of interventions aimed at preventing overweight (3).

(Non) Compliance – Adolescents and their parents

The effectiveness of an intervention is dependent on the compliance to the program. For Go4it this involves compliance of both the adolescents and their parents.

- Adolescents

In the case of the Go4it intervention, adequate compliance of the adolescents - defined as attended ≥ 5 of the 7 Go4it sessions - was problematic. Mean compliance was 59%. Unfortunately, we have no data on the quality of participation. Main reasons for not attending the Go4it sessions included lack of motivation, previous unsuccessful dieting experiences, travel distance and time issues. Besides this, another important reason for not attending the Go4it sessions were unrealistic weight loss goals. More than once the adolescents wanted to lose more than 20 kg in the period of the 7 Go4it sessions conflicting with healthy weight loss practices. Because of these unrealistic goals they lost interest and motivation when weight loss occurred more slowly. Our level of attrition was 44% (49% in the intervention group and 37% in the control group) at 18 months. This is comparable to previous studies concerning obesity treatment in adolescents (12-56%) (8-10). In future research more attention and effort should be devoted to realistic goal setting, barriers perceived by the adolescents for changing habits, motivations for weight loss and attending this program to improve compliance.

- Their parents

Support from parents was also a reason for non-compliance. This was surprising because mainly the parents initiated the consultation in the VU University Medical Center. The main reasons for non-compliance of parents were lack of success in their child's weight loss. Some parents disagreed with our lifestyle recommendations or found it old fashioned. A quote of a parent: "the dietician thinks that children have to eat a sandwich, but that is not right, our children eat pizza or a filled roll". In future interventions more effort should be devoted to active involvement of parents including realistic goal setting with respect to weight loss practices.

Enrolment

The enrolment of adolescents went slowly. To enroll a sufficient number of adolescents to start the intervention sessions within 2 months after inclusion we started with randomly assigning more subjects to the intervention (60%) than the control group (40%). One reason for the slow enrolment was that fewer

obese adolescents signed in at the obesity outpatient ward than expected. Because of the slow enrolment it sometimes took several weeks to start a new Go4it group. This waiting time was sometimes a reason for adolescents and their parents to withdraw from participation.

Blinding

The dietician and research assistants could not be blinded to group assignment because they were involved in both arranging the measurements, conducting the measurements, delivering the intervention materials and performing the Go4it sessions. Performing all measurements and the Go4it sessions according to a standardized protocol minimized the potential for observer bias.

Outcome measures

The quality of measurement instruments can be judged by their reliability, validity, sensitivity to change, and their feasibility.

Anthropometry, body composition and resting energy expenditure

We measured body height, body weight and waist circumference according to a standardised protocol. Body composition was measured by DXA and BIA. These objective measurements are a major strength, since weight, BMI or BMIsds does not discriminate between lean and fat mass. At baseline, the study group had a mean weight of 92.1 kg (mean fat mass was 41%), BMI of 33.2 kg/m², and a BMIsds of 2.93. This indicates morbid obesity and a high risk of the metabolic syndrome. To reduce the risk of the metabolic syndrome, it is not only necessary to lose weight but more important to lose fat mass. By measuring the body composition after 18 months follow up, we could show that the average weight loss of 2.09 kg consisted of 81% fat mass. On an individual level it was motivating to see that the fat-free mass increased and fat mass decreased. For measuring REE, we used indirect calorimetry. If it is available, this is the best way to measure REE in this population and on an individual level. We used the results of the REE also as a motivation tool. Many adolescents and their parents thought the cause of the overweight was their 'slow metabolism'. By measuring the REE, we were able to demonstrate that none of the adolescents had a slow metabolism, but that their obesity was the result of an imbalance in dietary intake and physical activity. Unfortunately, the indirect calorimetry is an expensive measurement and therefore not commonly used.

Metabolic components

Obesity in childhood increases the risk for metabolic syndrome, which is a group of cardiovascular risk factors including increased waist circumference, hypertension, dyslipidemia, and impaired fasting glucose levels (11). In the Go4it study, we also measured the insulin levels. High insulin levels are a

consequence of insulin resistance which can cause hyperglycaemia and ultimately type 2 diabetes mellitus (12-14).

In the Go4it study, we only found significant treatment effects in adolescents from western descent (mean BMI_{SD}s reduction of 0.35) on body composition and metabolic components (systolic and diastolic blood pressure and HDL cholesterol level). Unfortunately, we were not able to show significant reductions in insulin levels. These results are in line with the observations of Ford et al. that improvements in body composition and metabolic components in obese adolescents can be expected with BMI_{SD}s reduction of ≥ 0.25 (15). Of the 6 comparable randomised controlled trials evaluating treatment programs for obese adolescents (9;12-15), only 2 studied the impact of the intervention on metabolic components. Both studies found no significant reductions in the metabolic components.

Questionnaires (dietary and activity behaviour)

Dietary behaviour, physical activity and sedentary behaviour were assessed by self-report. Dietary behaviour was classified in: drinking behaviour (sugar-containing beverages (soft drinks and fruit juice), diet soft drinks, water and milk beverages), eating in between meals (snacks, low energy snacks, fruit and vegetables) and breakfast frequency (days per week) (16). The questions were based on validated questionnaires, for assessing dietary intake and referred to the past 7 days (17,18). Physical activity and sedentary behaviour were assessed with the Activity Questionnaire for Adolescents and Adults (AQuAA) (19). The AQuAA assessed the amount of minutes per week spent on light, moderate and vigorous-intensity physical activity, as well as time spent watching TV and using the computer and refers to activities in the past week (7-day recall). It took the adolescents approximately 60 minutes to complete the questionnaires. Many adolescents found this too long and very boring. The use of self-report is also subject to recall bias and dependent of participant understanding and motivation. Unrealistic values concerning drinking behaviour, values above the 95th percentile, were recoded as the value of the 95th percentile. After this adjustment, the mean intake of beverages (soft, fruit, diet, milk and water) was still >3000 ml a day. 53% of the adolescents also provided unrealistic answers (>16 hours of activity a day) to the questions on physical and sedentary behavior (AQuAA). These unrealistic answers proved the limited validity of the questionnaire in our sample. For this reason, we decided not to publish these data.

Cost diaries

As part of the Go4it study, also an economic evaluation was performed. As the economic evaluation was conducted from a societal perspective, all costs were collected, regardless of who paid for them. These costs included direct costs of health care utilization, namely the costs of the Go4it intervention, visits to the

general practitioner, allied health care including dietician visits, medical specialist care and prescribed and non-prescribed medications. In addition, direct costs outside health care, such as travel expenses to the obesity clinic or dietician, complementary care, sports costs and attendance at the parents sessions were also collected. The costs of the intervention was estimated by adding the costs of personnel, development, information sheets and workbooks, pedometers and the rent of the room for the group sessions. Cost data was collected monthly in cost diaries completed by the parents.

Of the 122 adolescents, 39 participants completed none of the cost diaries, despite all the reminders. Reasons for not filling in, were refusal (financial matters are private), or the questionnaire was too complicated, or they already forgot if they were ill or had an appointment with the general practitioner. Of the remaining 83 cost diaries, only 30 were of participants who were present at five or more Go4it intervention sessions. Because of this large amount of missing data, we were not able to draw conclusions about the cost effectiveness of Go4it. Further research is needed on the development and validation of self-administered or digital cost diaries in this population given their important role in the evaluation of health intervention programs.

Generalizability

Before implementation of a multidisciplinary group treatment, its generalizability needs to be considered. In 2011, 14% of the youth were overweight, and 2 percent obese (20). Our study population existed of mainly obese adolescents (n=110); only a small number of the adolescents were overweight (n=12, 10%).

The low adherence to the Go4it program limits the generalizability of our findings. At 18 months follow-up the level of attrition was 44% (49% in the intervention group and 37% in the control group). Ball et al. found an attrition rate of 20-40% on the short term (20 weeks) in this target group (8). Also, Nguyen et al. reported 38%, and Savoye et al. even 56% attrition (10,21). Therefore, this level of attrition is comparable to other studies concerning obesity treatment in adolescents (12-47%) (8-10,21-26). Many adolescents were not motivated to attend the Go4it sessions every other week. Even after signing the informed consent form, some adolescents and their families were not willing to complete participation. We encouraged participant compliance by sending reminders using text messages and phone contact one week before the sessions. The main reasons for not attending the Go4it sessions were the travel distance and the limited time of working parents and schoolchildren. Therefore, we recommend implementation of Go4it in a setting closer to the home environment, such as the child health care environment or school setting.

Relevance and Implications for public health and clinical practice

This paragraph describes the public health implications of our results and directions for future research. However, to give a complete overview it is necessary to have insight into current treatment options.

Focus on motivation and compliance

More attention should be paid to measure (by questionnaire) and improve the motivation of the adolescents and their parents to health behaviour change. In order to increase compliance, a few options were described below to decrease the barriers some parents and children experienced.

Focus on implementation of evidence-based treatment programs for obese adolescents

The Go4it intervention showed some promising effects on BMIIs, body composition and quality of life. Still we believe there are some adjustments needed to implement the Go4it intervention, such as better tailoring to non-western ethnicities, adding a physical activity program, and a location closer to their home environment.

Focus on practical constraints before disseminating the Go4it intervention

Since travel distance and the limited time of working parents and schoolchildren was one of the main reasons for non-compliance, implementation of the intervention nearby, home or school may improve compliance.

Consider subgroups in ethnicity

The Go4it study clearly showed differences in behaviour and intervention effects between western and non-western ethnic groups. In order to optimize the intervention, more attention should be paid to the tailoring of the intervention program to specific subgroups e.g. taking into account the ethnical differences in parental and child beliefs according to obesity and lifestyle habits.

Focus on behavioural problems

A study by Melnyk and colleagues (2006) indicated that, higher levels of depressive and anxiety symptoms and lower self-esteem in overweight teens were associated with less confidence about their ability to engage in healthy lifestyle behaviors (27). It seems useful to assess the levels of anxiety, depressive symptoms and self-esteem in obese teens, and if necessary to adapt the Go4it sessions e.g. by extra attention to these symptoms or individual guidance of a psychologist.

Increasing parental involvement

The Go4it program, included 2 parent sessions. We learned, however, during the intervention that parents may be more important than assumed initially and that their knowledge of a healthy lifestyle was inadequate. Besides this, we noticed that the parents had high levels of concern for their obese adolescents well-being, but also a sense of helplessness how to help their children. The main reasons for non-compliance of parents were lack of success in their child's weight loss. Thus more effort should be devoted to stimulate active involvement of parents including realistic goal setting with respect to weight loss practices and more education about healthy lifestyle and coaching of their child.

Focus on an exercise program

During the development of Go4it, we encouraged participants to go walking or cycling instead of taking the bus or subway. Besides this we also encouraged them to join sports clubs in their neighbourhood instead of organising specific exercise sessions. However, the majority never joined a sports club. Reasons for this were lack of interest, lack of time and financial reasons or being ashamed to go to a sports club, because of their overweight. It seems important to develop specific exercise program for this target group to encourage and support them to become more active. It is shown that exercise is efficacious for reducing percent body fat in overweight and obese adolescents (28). Another study showed that participation in an exercise group can be a predictor of success in outpatient treatment in obese adolescents (29,30). Including an exercise program to the Go4it program might therefore increase the effectiveness of Go4it (28).

Improve measurement tools for the evaluation of obesity treatment programs

In our study it became obvious that the questionnaires were not appropriate for our study sample. Questions were not always clear to them, and the questionnaires were for some adolescents too long. Therefore, more effort should be devoted to the development of measurement tools (such as questionnaires) that are valid, reliable, sensitive to detecting subtle behavioural changes (diet, sedentary and physical activity behaviour) and also attractive and appropriate for the target population. Given today's adolescents' heavy use of smartphones, apps, facebook and videogames it may be a feasible way to promote healthy energy balance-related behaviors such as increasing fruits and vegetables intake, water intake, and physical activity and decreasing intake of snacks and sweetened beverages.

Conclusion

We conclude that, at 18 months follow-up the Go4it intervention showed a significant reduction in BMI_{SD}s, compared to current regular care in obese adolescents. No significant effects on body composition or metabolic components were observed. Larger benefits were achieved for adolescents of western ethnicity. At 18 months follow up significant treatment effects were observed on BMI_{SD}s, systolic and diastolic blood pressure, as well as HDL cholesterol, but only for obese adolescents from western descent. Also, small but beneficial intervention effects on quality of life were found as a result of the Go4it intervention

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