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

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Chapter 5

The effect of family-based multidisciplinary cognitive behavioral treatment on Health Related Quality of Life in Childhood obesity

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Journal of Adolescent Health, provisionally accepted

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ABSTRACT

Purpose
Childhood obesity can have a huge impact on both somatic as well as on psychosocial functioning. The aim of this study was to evaluate the effect of multidisciplinary treatment on obesity and Health Related Quality of Life (HRQOL).

Methods
Obese children were randomized to a multidisciplinary treatment (n=40, body mass index (BMI)-SDS; 4.2±0.7, age;13.3±2.0) or standard care (n=39, BMI-SDS 4.3±0.7, age;13.1±1.9). At baseline (T0), after 3 months (T1) of treatment and after 1-year follow-up (T2), data were collected for BMI-SDS and 2 European based validated questionnaires for assessing HRQOL (KIDSCREEN, DISABKIDS). Data of normal weight control group was collected once for comparison of HRQOL.

Results
At T0 obese children showed significantly lower HRQOL compared to their normal weight peers (p=0.02). A significantly reduced BMI-SDS was found for the intervention vs. obese control group at T1 (4.0±0.9 vs. 4.2±0.7, p=0.02) and T2 (3.8±1.1 vs. 4.2±0.7, p=0.03). HRQOL in the intervention group was improved at T2 compared to T0 (mean [95%CI]; 86.8[83.3-90.3] vs. 80.2[76.5-83.8], p<0.05), and unchanged in the obese control group. Parents reported a lower HRQOL for their obese children than the children themselves, with inter-class correlation coefficients for agreement varying between 0.669-0.847 for total HRQOL.

Conclusion
HRQOL is more impaired in obese children compared to their normal weight counterparts and parents reported a lower HRQOL than their children. Multidisciplinary treatment is effective in reducing BMI-SDS and improving HRQOL after 1-year follow-up.

Trial Registration
http://www.controlled-trials.com/ISRCTN36146436.

Key words: Health related quality of life; obesity; weight loss; children; adolescents; treatment; parents

INTRODUCTION

During the last three decades the prevalence of childhood obesity has increased dramatically in Western countries, with the Netherlands not making an exception. Consequence of the rising prevalence of childhood obesity is an earlier appearance of co-morbidities such as type 2 diabetes mellitus and cardiovascular diseases [1,2]. Besides these physiological consequences, obesity can also have adverse consequences for psychosocial well-being [3,4]. Research has revealed that children with obesity show impaired self-esteem and lower scores for Health Related Quality of Life (HRQOL) with regard to physical functioning [3], indicating that obese children experience a burden of their overweight status both in their physical performance as well as in their self-esteem. Furthermore, peer victimization of obese adolescents has been associated with low self-esteem, body dissatisfaction and social isolation [4]. Some authors even suggested that the HRQOL of severely obese children is comparable to that of children with cancer [5].

It appears that the HRQOL of obese children is particularly impaired concerning social and physical functioning in relation to the degree of overweight [3,6-11]. Children with obesity experience less social support from either their family or peers, and perceive more discomfort from their body weight on mobility in everyday life. Conflicting results have been reported concerning the effect of obesity on the psychological domain of HRQOL. While some investigators have found a weak [9] to moderate [8] association between obesity and the psychological domain of HRQOL, others reported no relationship at all [11,12]. The studies in which associations were observed were carried out in treatment seeking obese samples [8,9]. In obese children in community settings no adverse effect of their obesity on the psychological well-being was observed [11,12].

With respect to the parents' perspective on psychological QOL, parents view their children as having greater impairments in emotional functioning than children report themselves [9,12]. Indeed, studies examining the agreement between a child self-report and a parent proxy report showed consistently lower HRQOL scores for all domains from parent proxy assessment than from child self-report [7,12]. The reason for this difference is not yet clear [13].

The observations that childhood obesity has multifaceted consequences in both the physical and psychological area [1-4] has led to an increased inclusion of psychological aspects in the treatment of childhood obesity, apart from existing physical activity and nutritional advices. Reducing body weight for height (expressed as body mass index, kg/m^2 (BMI)) as well as improving HRQOL is the aim of most of these multidisciplinary treatments of children with obesity. The effects of such lifestyle interventions on maintenance of weight loss, however, are only small to moderate [14,15].
Furthermore, conflicting results have been reported on the effects of multidisciplinary treatment on HRQOL in obese children, probably due to the use of different outcomes for HRQOL. Some studies have reported increased HRQOL in all QOL variables after short-term multidisciplinary treatment, assessed by both a QOL questionnaire and a Pictorial Representation of Illness and Self Measure (PRISM) [16] or by means of a disease-specific quality of life measure [17]. Others, using the more general Pediatric Quality of Life Inventory (PedsQOL) [18] or the KINDL (German questionnaire for measuring quality of life in children and adolescents) [19], reported improvement in some of the QOL domains, but not in the psychological domain.

There is a need for further documenting the short- and long-term HRQOL of children receiving multidisciplinary treatment for obesity. Therefore, the primary goal of the current study was to assess the effect of a multidisciplinary cognitive behavioral treatment, focused on reducing BMI and improving HRQOL in obese children, assessed by both self-report and parent proxy report.

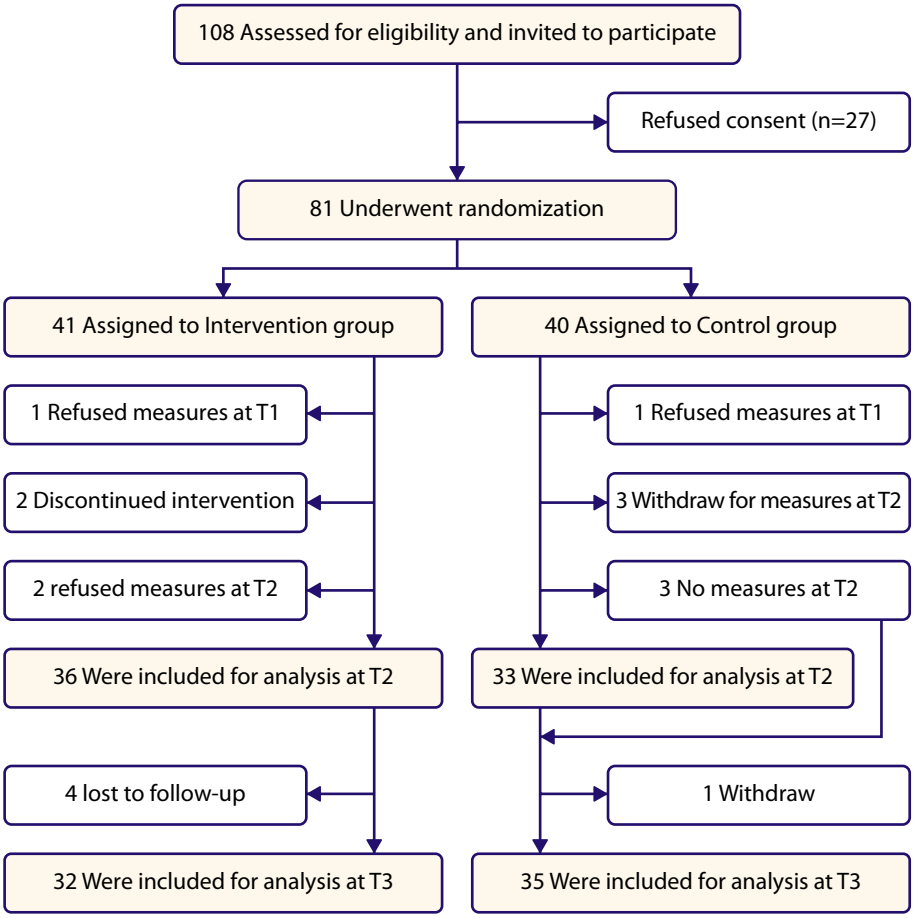
METHODS:

Study Design and Setting

This study is part of a randomized clinical trial on the effect of a multidisciplinary cognitive behavioral treatment on childhood obesity. For full details of the protocol the reader is referred to our previous report [20]. Here the effects of the treatment on HRQOL immediately after 3 months treatment and after 1 year are presented. Newly presented children with obesity according to Cole's reference values [21] aged 8-17 years, living in or close to the Hague and referred to a pediatrician for their obesity, were invited to participate.

Obese children who met inclusion criteria were stratified by gender and ethnicity ('North European' and 'Other') and randomized to the intervention (n=41) or control group (n=40) according to coin-tossing (figure 1). In order to obtain a similar size of the intervention and control groups, blocked randomization was applied with an allocation ratio of 1:1. Randomization was carried out by a member of the team who did not take part in the treatment. The children in the intervention group were divided into smaller groups of 10, depending on the child's age. Potential participants were excluded if their knowledge of the Dutch language was insufficient. Other exclusion criteria were use of medication that might have an effect on weight loss, medical co-morbidities that could affect participation (e.g. hypothyroidism, high dose of glucocorticoids, diabetes mellitus) or previous enrollment in another cognitive behavioral treatment program with the focus on reducing obesity. To enable comparison of the HRQOL data of the obese children with normal weight peers, 34 healthy age, gender and ethnicity matched children with normal weight, recruited by the youth health services (Jeugd GGD Haaglanden), were examined once. This study was conducted in agreement with the 'Declaration of Helsinki'. Approval was obtained from a regional medical ethical committee South West Holland. All parents and children gave their written informed consent.

Figure 1: *Flow diagram of participants through the study for the primary outcome measure (BMI-SDS)*



Multidisciplinary cognitive behavioral treatment

The multidisciplinary cognitive behavioral treatment of the intervention group consisted of a screening phase, followed by an intensive phase of three months and booster sessions thereafter for a total period of two years. In the screening phase the children with their parents were seen at two separate occasions individually by a dietitian (45 minutes/occasion), a child-physiotherapist (45 minutes/occasion), a child-psychologist (90 minutes/occasion) and once by a social worker (90 minutes).

During the screening phase a dietician provided nutritional advice on reducing caloric intake and, more importantly, on learning healthy eating behavior. A 3-day dietary recall (1 weekend day included) was used to get more insight in dietary habits of the children. Information was provided about nutrition and healthy eating behavior according to the traffic light nutritional list [22]. The traffic light nutritional list identifies several main food groups (fruits, vegetables, grains, milk and other dairy products, meat, fish, and others).

Foods within each group are color-coded reflecting the caloric density per average serving and Dutch standards for healthy nutrition. The colors are green for "go", orange for "approach with caution", and red for "stop". A child-physiotherapist evaluated the physical activity level of the children in the intervention group, based on a physical activity 3-days recall (1 weekend day included). The information from this recall was used for advice on how to increase and optimize physical activity during everyday life and to reduce sedentary activities. The role of the child psychologist was to help the children not only to reduce weight by learning cognitive behavioral techniques, but also to deal with and accept their own body.

The intensive phase of the treatment consisted of 7 group meetings for the children, 5 separate parent meetings and 1 meeting for parents together with their children. Meetings of 2½ hours per meeting were given biweekly. The main focus of the first two meetings with the children was on nutritional information of energy balance and healthy eating. During the remaining meetings with the children, several cognitive behavioral techniques were taught on self-control, coping and self-image, in order to maintain long-term lifestyle change and body weight reduction. The parent meetings addressed the topics of motivation for treatment of their children, including information on healthy nutrition, setting boundaries and how to help their children by giving positive feedback.

The control group was given an initial advice on physical activity and nutrition. After 1 year the children in the control group were offered to participate in the multidisciplinary cognitive behavioral treatment. The normal weight control group was measured only once at the beginning of the study.

Primary outcome

Data from the obese subjects were collected at baseline (T0), after the three months treatment (T1) and 1 year after baseline (T2). Weight to the nearest of 0.1 kg was measured using an electronic scale (SECA 911, Vogel & Halke, Hamburg, Germany) and height to the nearest of 0.1 cm with a stadiometer (Holtain, limited, Crymych, Dyfed, Britain) in underwear and barefoot. BMI was calculated as weight / height squared (kg/m^2). Subjects were classified as obese using BMI gender- and age specific international cut-off levels [21]. BMI was expressed as a standard deviation score (SDS) for Dutch references[23]. The 1980 reference data for weight and height were used to obtain a realistic view on the degree of obesity without data being biased by the increased prevalence rate of childhood obesity.

Secondary outcomes

The Health Related Quality of Life (HRQOL) of the children was determined by a generic questionnaire (KIDSCREEN) and a questionnaire for chronic conditions (DISABKIDS). The KIDSCREEN questionnaire was used to assess differences in HRQOL between obese and normal weight peers. The DISABKIDS questionnaire was used to evaluate the effect of the treatment on HRQOL in the obese children and their parents.

The KIDSCREEN questionnaire is suitable for children aged between 8-18 years and both a child as well as a parent proxy version are available. In this study only the child version was used to compare obese children with the children in the normal weight control group. The KIDSCREEN contains 52 questions addressing 10 domains of quality of life.

These domains are: QOL-physical, QOL-psychological, QOL-mood, QOL-self-perception, QOL-autonomy, QOL-parents, QOL-peers, QOL-school, QOL-bullying, QOL-financial. Each domain contains 3-7 items. Questions can be answered by choosing from a 5-point scale: options: never (1), almost never/ seldom, average/ sometimes, quite often, always (5). After adjusting the negative items, the total and domains scores of the questionnaire are expressed as a percentage between 0-100, with a higher percentage reflecting a better HRQOL. The KIDSCREEN questionnaire has demonstrated a Cronbach α reliability coefficient ranging between .77 and .89 for all ten domains [24], which is considered as a good reliability.

The DISABKIDS questionnaire is suitable for children aged between 4-18 years. In this study the DISABKIDS was used to compare the HRQOL of the obese children in the intervention group with the HRQOL of the children in the obese control group. Because the children's scores on HRQOL questionnaires are often higher than parental scores, we also used the parent version of the DISABKIDS questionnaire. The DISABKIDS questionnaire contains 37 questions divided over 6 subscales of 6-7 items each. In this study only the first five subscales (31 items) were used to calculate the HRQOL, because the last subscale focuses on medication use related to a disease. The five subscales that were included in this study are: QOL-life, QOL-day, QOL-feeling, QOL-other and QOL-friends. The questions could be answered by choosing from a 5-point scale: never (1), almost never/ seldom, average/ sometimes, quite often, always (5). After adjusting the negative items, the total and domains scores of the questionnaire were expressed as a percentage between 0-100, with a higher percentage reflecting a better HRQOL. The Cronbach α reliability coefficient of the child version of the DISABKIDS ranges between .70 to.87 for children aged 8-12 years and between .77 to.90 for children aged 13-16 years [24]. To our knowledge no results have been published of reliability coefficients concerning the parent proxy version of the DISABKIDS questionnaire.

Statistical analysis

Intention-to-treat analyses were performed using the Statistical Package for Social Science SPSS, version 17.0 for Windows (SPSS Inc., Chicago, IL, USA). An independent t-test was used to compare the obese children vs. the normal weight children at baseline. For comparison of the HRQOL domains at baseline between obese and normal weight children ANOVA analysis was used with Bonferroni correction for multiple testing and group as fixed variable. The total HRQOL score was analyzed separately. To determine the effect of time on the outcome variables within the groups ANOVA for repeated measures was performed for the domains with Bonferroni correction and for the total HRQOL and BMI-SDS separately with time as fixed variable. The effect of treatment on the total HRQOL scores and BMI-SDS were analyzed with ANOVAs for repeated measures with group and time as fixed variables. MANOVAs for repeated measures were used to determine the effect of treatment at T1 and T2 on HRQOL domains, both for the child and parent proxy report separately. In addition, an inter-class correlation coefficient (ICC) was used to describe the relationship between the child and parent proxy report for the total HRQOL scores and per domain. The level of significance for all analyses was set at $p<0.05$.

RESULTS

Treatment effect on BMI-SDS

The ANCOVA for the effect of the multidisciplinary treatment on BMI-SDS at T1 and T2, controlling for baseline measures, was statistically significant (p=0.02 and p=0.03, respectively), showing a reduction of BMI-SDS in the intervention group and no change in BMI-SDS in the obese control group.

HRQOL in obese vs. normal weight children

The results of HRQOL for the KIDSCREEN questionnaire for the intervention group, obese control group and normal weight control group at baseline are shown in table 1. No significant difference was found for age and gender between the obese and normal weight children. Total HRQOL was significantly lower in the obese group compared to the normal weight controls: (mean (SE) 83.0(0.9) vs. 86.7(1.1), p=0.02, respectively), as well as for the domains QOL-physical (mean (SE) 70.7(1.9) vs. 82.9(2.4), p<0.01, respectively) and QOL-self-perception (mean (SE) 69.0(1.9) vs. 85.891.9), p<0.01, respectively), indicating that obese children have impaired HRQOL, in particular for physical functioning and self-perception.

Table 1: *HRQOL of obese children vs. normal weight children at baseline*

Variable	Intervention group	Obese control group	Normal weight group
	M [95% CI]	M [95% CI]	M [95% CI]
Gender (M/F)	**18/22**	**19/20**	**14/20**
Age (years)	13.3 ± 2.0	13.1± 1.9	13.2 ± 2.4
BMI-SDS	4.2 ± 0.7‡	4.3 ± 0.6‡	0.5 ±1.4
QOL-Tot-Kid	81.4 [78.4;84.4]‡	84.7 [82.4;86.9]‡	86.7 [78.4;84.4]
QOL-physical	66.3 [61.5;71.0]‡	75.2 [69.5;80.9]‡	82.9 [78.0;87.8]
QOL-psychological	86.3 [82.9;89.8]	88.2 [84.1;92.3]	90.1 [87.3;92.9]
QOL-mood	83.9 [79.4;88.4]	84.7 [81.3;88.1]	87.1 [83.5;92.9]
QOL-self-perception	69.1 [63.7;82.9]‡	68.9 [63.4;74.3]‡	85.8 [819;90.8]
QOL-autonomy	83.1 [77.9;88.2]	87.3 [83.3;91.3]	87.3 [83.9;89.7]
QOL-parents	89.6 [85.6;93.5]	92.4 [90.0;94.9]	91.9 [89.0;90.7]
QOL-peers	79.6 [73.7;85.4]	85.0 [81.0;89.1]	85.0 [80.9;94.7]
QOL-school	87.0 [83.2;90.8]	92.2 [85.7;92.2]‡	82.4 [78.4;86.4]
QOL-bullying	86.3 [81.1;91.6]	88.7 [83.8;93.6]	90.9 [87.7;94.0]
QOL-financial	77.6 [69.9;85.3]	86.1 [80.2;92.0]	82.7 [76.3;89.2]

** The mean difference compared to obese control group is significant at the 0.05 level*

‡ The mean difference compared to normal weight control group at the 0.05 level

Treatment effect on HRQOL

The results of the DISABKIDS questionnaire in the intervention and obese control groups at T0, T1 and T2 are shown in table 2. At baseline no significant difference was found for total HRQOL nor for the domains between the intervention and obese control group. ANOVA of repeated measures for measuring differences in HRQOL over time within both groups, showed a significant increase of total HRQOL, QOL-life and QOL-feeling for the child report from T0 to T2 only for the intervention group. For the parent proxy a significant increase in total HRQOL as well as QOL-day was found for the intervention group at T2 vs. T0. The (M)ANOVAs for repeated measures for assessing differences in the effect of treatment over time on total HRQOL and the domains did not show a significant difference in mean change between the two groups, neither for the child report nor for the parent part of the questionnaire.

Table 2: *Short-term and Long-term results of DISABKIDS HRQOL*

Variable	Child Report		Parent Proxy	
	Intervention group	Obese control group	Intervention group	Obese control group
	M [95% CI]	M [95% CI]	M [95% CI]	M [95% CI]
T0 (baseline)				
Age (years)	13.3 ± 2.0	13.1 ± 1.9		
BMI-SDS	4.2 ± 0.7	4.3 ± 0.7		
QOL-Tot-Dis	80.2 [76.5-83.8]	82.8 [78.4;87.2]	74.1 [70.2;78.0]	79.8 [74.6;85.0]
QOL-life	82.2 [77.7;86.8]	84.7 [80.7;88.8]	84.8 [80.9;88.8]	86.4 [82.9;89.8]
QOL-day	81.5 [77.0-86.0]‡	81.8 [76.3;87.2]‡	70.9 [67.4;86.0]	73.6 [68.6;78.7]
QOL-feeling	76.0 [70.6;74.3]‡	78.8 [73.7;84.0]‡	68.8 [63.2;74.5]	71.1 [65.2;76.9]
QOL-others	87.5 [83.6;91.3]	87.0 [82.4;91.7]	82.9 [78.1;87.7]	83.7 [78.9;88.6]
QOL-friends	74.9 [70.7;79.0]	77.7 [73.6;81.9]	72.1 [66.9;77.3]	76.6 [71.4;81.7]
T1 (3 months)				
Age (years)	13.8 ± 1.8	13.4 ± 1.9		
BMI-SDS	4.0 ± 0.9*	4.2 ± 0.7		
QOL-Tot-Dis	84.1 [80.8-87.5]	83.9 [79.3;88.6]	77.9 [73.5;82.3]	80.5 [75.8;85.2]
QOL-life	87.4 [82.9;91.8]	88.0 [84.2;91.9]	84.9 [79.4;90.5]	86.3 [82.5;90.2]
QOL-day	82.5 [78.1-86.9]‡	85.8 [80.7;90.8]‡	73.6 [69.3;86.9]	74.0 [67.4;80.7]
QOL-feeling	84.5 [79.5;77.9]‡	80.1 [73.9;86.5]	73.0 [66.3;79.7]	75.3 [69.0;81.6]
QOL-others	89.1 [84.8;93.3]	87.7 [83.0;92.5]	81.9 [76.2;87.5]	86.3 [81.1;91.5]
QOL-friends	76.7 [72.6;80.7]	79.9 [74.6;85.2]	72.4 [67.4;77.5]	79.8 [74.3;85.3]
T2 (1-year follow-up)				
Age (years)	14.4 ± 1.8	14.0 ± 2.0		
BMI-SDS	3.8 ± 1.1*	4.2 ± 0.7		
QOL-Tot-Dis	86.8 [83.3-90.3]*‡	85.6 [81.2;89.9]	82.9 [78.9;87.0]*	81.6 [75.9;87.4]
QOL-life	90.1 [87.1;93.1]*	87.3 [83.5;91.0]	88.9 [85.7;92.2]	88.3 [83.8;92.8]
QOL-day	83.7 [78.5-88.8]	85.4 [80.7;90.0]‡	78.4 [73.9;88.8]*	78.8 [72.1;85.6]
QOL-feeling	87.0 [81.2;82.9]*‡	83.3 [77.8;88.8]‡	77.8 [71.8;83.8]	78.8 [73.6;84.0]
QOL-others	92.4 [89.1;95.7]‡	91.3 [87.8;94.7]‡	86.7 [82.7;90.7]	84.8 [78.9;90.7]
QOL-friends	78.9 [73.7;84.1]	80.4 [75.7;85.2]	78.9 [73.7;84.1]	77.8 [71.2;84.5]

** The mean difference compared to baseline is significant at the 0.05 level*

‡ The mean difference compared to parent proxy perspective at the 0.05 level

Child self report vs. parent proxy report

The inter-class correlation coefficient for the total HRQOL of the DISABKIDS questionnaire between child and parent report was 0.669 at baseline, 0.705 at T1 and 0.847 at T2. Those ICCs indicate that conformity in the scores of HRQOL between children and parents increased over time from 66.9% to 84.7% agreement. For the separate domains of the DISABKIDS questionnaire a poor to moderate ICC was found varying between 0.484 (QOL-day) – 0.640 (QOL-others) at baseline, between 0.492 (QOL-feeling) – 0.756 (QOL-friends) at T1 and between 0.553 (QOL-others) – 0.773 (QOL-friends) at T2, with lower scores found in the parent compared to child report.

DISCUSSION

This study aimed at evaluating the effect of a multidisciplinary cognitive behavioral treatment on BMI-SDS and HRQOL in obese children compared to standard care. Improvements in BMI-SDS were found after 3 months of multidisciplinary treatment and 12 months follow-up, with no changes in obese children receiving standard care. Concerning the short-term treatment effect on adiposity, similar conclusions were made in numerous previous reports on multidisciplinary lifestyle interventions [25-28]. Contrasting findings by others were however reported with regard to the long-term treatment effects on adiposity [25]. In contrast to our findings, in the latter study the reduced body weight after treatment was not further reduced in half of the subjects and even significantly increased in remaining half during the follow-up period [25].

Effect of Obesity on HRQOL

With respect to the impact of obesity on HRQOL, we found significantly lower total HRQOL scores in the obese vs. the normal weight children as well as lower domain scores of physical activity and self-perception. These findings confirm the results of others, also reporting lower total HRQOL in obese compared to normal weight children [6,9,29]. The lower QOL-physical activity score found in the obese vs. normal weight children in the current study was in agreement with other studies as well [6,9,10,30]. However, observations on differences between obese and normal weight peers for the psychological and the social domain of HRQOL are more diverse. While impaired social functioning was found in obese children by most other investigators [6,9,11], we observed significantly lower scores for the psychological domain in obese children. These contradictory findings might be attributed to differences in the definition of the HRQOL domains in the questionnaires used. So far many studies [6,7,9-11] have used the Pediatric Quality of Life Inventory (PedsQL 4.0) questionnaire for comparing HRQOL between obese and normal weight children, which is only partly comparable to the KIDSCREEN questionnaire.

Short-term treatment effect on HRQOL

Immediately after treatment HRQOL scores had already improved, though not significantly. In contrast, in previous studies a significant short-term effect on HRQOL scores was observed after multidisciplinary treatment [16,17,19]. This difference might be explained by the different methods used to determine HRQOL, or by the different treatment mode. While we used a validated generic questionnaire, in these prior studies also a (non-validated) obesity specific QOL questionnaire was used, and findings were reported after in-patient instead of out-patient treatment [16,17,19]. It is conceivable that a disease specific instrument is more sensitive to short-term change in HRQOL since it targets the areas critical for obesity. This difference in short-term sensitivity for treatment effect

between questionnaires, emphasizes the need for a obesity-specific module of DISABKIDS, as is available for several other diseases. In addition, the amount of weight-loss after the in-patient interventions was larger than observed in our patients. We speculate that that the short-term weight loss in our study was not pronounced enough to cause a statistically significant change in HRQOL.

Long-term treatment effect on HRQOL

Exploring the long-term effect of multidisciplinary treatment on HRQOL, we found a significant improvement after 12 months follow-up in the intervention group. At this time a better total HRQOL was found, as well as improved QOL for the specific domains of QOL-life and QOL-feeling.
Improved HRQOL after follow-up and not yet immediately after treatment have been reported in a previous study [17]. In this study two multidisciplinary treatment regimens for obese children were compared, one with and the other without the inclusion of psychological counseling. The improved HRQOL was only observed in the treatment group with psychological counseling. Taken together, these findings indicate that inclusion of psychological interventions and face-to-face contact with health professionals continued during follow-up seems to be important for the long-term improvement of HRQOL of obese children.

Child self report vs. parent proxy report

Comparing the children's self-reports with the parent proxy reports, we found significantly lower HRQOL scores reported by the parents. In addition, a poor to moderate inter-class correlation coefficient was found between the child and parent reports. This finding is in conformity with previous studies [7,9,12] that also reported lower parent proxy scores compared to child self-reports with poor parent-child agreement in a treatment seeking obese sample [12]. It is important to emphasize that previous studies found a similar ICC between normal weight children and their parents [9]. So parents of treatment seeking obese children are possibly more worried about their child than the children themselves or they may have a limited understanding of their child's experienced HRQOL. It is also possible that parents view HRQOL from a broader perspective than children do and are therefore better able to compare the HRQOL of their obese child with that of normal weight children. Either way, by using both children's self-reports and parent proxy reports a more complete impression of HRQOL is gained.

Limitations of the study

One of the limitations of this study is that our study population consisted of treatment seeking obese children, who may experience more impairment on their HRQOL than their obese peers in the community. Previous studies have shown varying results, some showing no significant differences between treatment seeking and community-derived obese children [9]. Other studies have reported lower scores of HRQOL in a treatment seeking sample [8,11]. A second limitation of the current study is that we did not use the PedQL 4.0 or an obesity-specific HRQOL questionnaire, used by most previous studies. Using the DISABKIDS and KIDSCREEN questionnaires, however, could also be regarded a strength, since this questionnaire is a European based and well validated questionnaire.

Strengths of the study

One important strength of the study is the randomized controlled design, studying the longitudinal effect of a multidisciplinary cognitive behavioral treatment on HRQOL in obese children compared to standard care. Whereas most other studies only report cross-sectional data or short-term treatment effect after non-randomized interventions, we randomly assigned our patients to an intervention and control group. By including a randomly allocated control group it was possible to detect if HRQOL further declined or remained stable when children were not treated. Additionally, the use of both self-reports as well as parent proxy reports in this study gives more information on the HRQOL of children and can help to determine at which level treatment can be improved. Furthermore, by assessing both self-report and parent proxy report it is possible to compare our results with previous studies using either one or both forms of report.

CONCLUSION

In conclusion, the obese children in our study showed significantly lower HRQOL compared to their normal weight peers. In particularly for physical functioning, lower HRQOL scores were found in obese children and agreement between child and parent report was moderate, with lower scores found by parent proxy report. In addition, obese children receiving multidisciplinary treatment showed a significant reduction of their BMI-SDS as well as significantly improved HRQOL after 1 year follow-up. However, although a significant weight reduction was found in the intervention group, the majority of the children were still obese after the multidisciplinary treatment. HRQOL assessment in children with obesity can help understanding the impact of obesity on everyday life and how it affects the child's well-being. Results of these HRQOL measurements can be used to improve treatment of obese children; for example the most impaired domains of HRQOL can be considered in greatest need of extra attention in the multidisciplinary treatment. In addition, more longitudinal studies on the effect of multidisciplinary treatment on HRQOL in obese children are needed to explore how treatment programs for obesity can be improved.

ACKNOWLEDGEMENTS:

The study was partly funded by an unrestricted educational grant by Pfizer and an unrestricted educational grant by a non-profit foundation ("de Stichting Vrienden van het JKZ"). We acknowledge and appreciated the helpful advice about the KIDSCREEN and DISABKIDS questionnaires by Dr. H.M. Koopman. We also thank N. Kist for her help with implementing data for analysis. In addition, we thank all members of the multidisciplinary team for their time and patience in treating the children, and the participating children and their families.

CONFLICT OF INTEREST STATEMENT

All authors declare no conflict of interest. This research was carried out at the Department of Pediatrics, Juliana Children's Hospital, The Hague, the Netherlands.

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