

Childhood Obesity, Weight Loss and Long Term Development in Quality-of-Life: A Longitudinal Follow-Up Study.

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Abstract

Background To evaluate long-term effects of a multifactorial lifestyle intervention on measures of quality-of-life (QoL) in children with obesity.

Methods One hundred and twenty children age 4-17 years with a BMI standard deviation score (BMI-SDS) >2 participated in a multifactorial lifestyle intervention. QoL and wellbeing were measured by a 6-item Visual Analogue Scale (VAS) throughout the intervention.

Results Follow-up time was 26.4 months (13.9 SD). VAS scores decreased on bullying (0.6 vs. 0.0 median) and in motivation (10.0 vs. 9.6). QoL increased in children with a BMI-SDS reduction (0.65 (2.49 SD)) opposite children with no-change or increasing BMI-SDS who reported reduced QoL (-0.36 (1.55 SD) and -0.96 (2.27 SD)). Boys experienced reduced appetite (6.7 (2.3 SD) to 5.7 (2.6 SD)), bullying (median 0.4 vs. 0.0) and motivation (median 10.0 vs. 8.9), while girls experienced reduction in bullying (median 0.6 vs. 0.0) and an enhancement in Joy of Life compared to boys (0.73 (2.10 SD) vs. -0.04 (2.08 SD)).

Conclusion Multifactorial lifestyle intervention for children with obesity induces long-term BMI-SDS reduction for the majority, and exerts significant reduction in bullying and improves QoL if weight loss is obtained and maintained.

Background

Children with obesity have decreased quality-of-life (QoL) compared to lean peers, and comparable to QoL in children having cancer [1]. Low QoL is associated with a higher risk of discrimination and bullying, which may lead to low self-esteem and even overt depression [2].

The Visual Analogue Scale (VAS) is a simple instrument with good validity and reliability. The VAS instrument is applicable to children who have insufficient reading skills and is therefore also useful in younger children [3].

Effects of lifestyle intervention on QoL after weight loss are only reported in a limited number of studies and rarely with follow-up for more than 12 months. Recently, a 14 months multifactorial lifestyle intervention in children with obesity reported increased QoL, mood, and body satisfaction whereas appetite, bullying, and motivation were decreased. Interestingly, similar positive changes were observed in five of the six VAS items in the 24.4% of children who increased their Body Mass Index-Standard Deviation Score (BMI-SDS) during the intervention [4]. The aim of our study was to evaluate long-term effects of a comparable multifactorial lifestyle intervention on measures of QoL in children with obesity.

Methods

Definition of overweight and obesity

Overweight and obesity in growing individuals are defined by an abnormal BMI-SDS (or z-score) or a BMI above a defined percentile. BMI-SDS was calculated using GrowthXP (PC Pal, Wissous, France).

Patient and public involvement:

All children in our outpatient clinic for childhood obesity, their parents or legal guardians were invited to participate and the treatment efficiency was depended on their motivation, however, no formal patient and public involvement was performed.

Subjects:

One hundred and ninety-nine children age 4 to 17 years with a BMI-SDS > 2 [5] participated in The Children's Obesity Clinic's Treatment (TCOCT) protocol from January 1st 2014 to December 31st 2017. One hundred and twenty children completed at least two VAS-questionnaires; one of these at baseline. At baseline, data on obesity and mental illness predisposition were recorded. For all children a parent or legal guardian provided a written informed consent. All children were invited for a last visit and a renewed VAS in December 2018, one year after the TCOCT-project ended. No control group was included. Even though this trial was not a randomized study, the CONSORT-concept was followed.

The TCOCT protocol

TCOCT is a family-centered multifactorial lifestyle intervention developed for treatment of children with overweight and obesity.

The TCOCT protocol is described in detail elsewhere [4]. In brief, participants had one yearly visit at our outpatient clinic and 6–8 municipality-based visits in-between.

At each visit at the outpatient clinic, anthropometry was measured and a six items VAS was completed. Results on anthropometry, body composition, and metabolic parameters have previously been reported [6].

VAS – Visual analogue scale

VAS recordings were performed at all visits at the outpatient clinic and used to evaluate participant's well-being in six different areas: 1. Joy of living (JoL), 2. QoL, 3. Appetite, 4. Bullying, 5. Motivation for losing weight, and 6. Body perception (Bpc). The child was instructed rigorously by a healthcare professional in a uniform way to rate his/her current state of mind expressed by the different VAS items with a single cross on a 10 cm vertical blank line, unnumbered except 0 and 10.

Statistics

Data was collected and managed using REDCap electronic data capture tools at Aarhus University. Statistical analyses were performed in Stata 15 (StataCorp, College Station, Texas). ANOVA was used to analyse data if normal distributed. Non-normal distributed data were analysed by Wilcoxon rank-sum (2 groups) or Kruskal-Wallis (more than 2 groups) tests. P-value of < 0.05 was considered statistically significant.

Results:

Baseline:

One hundred and twenty children with obesity and a mean age of 10.4 years (2.8 SD) were included in this trial. The distribution of gender was 56 (46.7%) boys and 64 (53.3%) girls. Approximately 90% of the participants were predisposed to obesity, 50% from both parents. Only one child was due to adoption unaware of any predispositions (Table 1). At baseline, mean BMI-SDS was 3.1 (0.7 SD), with boys more overweight (BMI-SDS 3.3 (0.7 SD) vs. 2.9 (0.6 SD), $p < 0.001$) and hungry (VAS 6.7 (2.3 SD) vs. 5.6 (2.4 SD), $p = 0.013$) than girls.

Table1: disposition and social conditions at baseline

Factor	Value
N	120
Age, years, mean (SD)	10.4 (2.8)
BMI-SDS, mean (SD)	3.1 (0.7)
Sex	
Male	56 (46.7%)
Female	64 (53.3%)
Disposition - overweight	
One parent	49 (40.8%)
Both parents	60 (50.0%)
No dispositions	10 (8.3%)
Unknown	1 (0.8%)
Disposition - mental illness	
One parent	31 (25.8%)
Both parents	7 (5.8%)
No dispositions	81 (67.5%)
Unknown	1 (0.8%)
VAS1, Joy of living, median (IQR)	9.1 (7.3, 10.0)
VAS2, Quality of life, median (IQR)	9.6 (7.6, 10.0)
VAS3, Appetite, median (IQR)	5.4 (4.6, 8.1)
VAS4, Bullying, median (IQR)	0.6 (0.0, 4.7)
VAS5, Motivation, median (IQR)	10.0 (9.0, 10.0)
VAS6, Body perception, median (IQR)	6.1 (3.1, 9.6)

Throughout the trial 81 children (68.5%) achieved a BMI-SDS reduction ($< -0.1 \Delta \text{BMI-SDS}$), 19 children (15.8%) experienced no change (-0.1 to 0.1 $\Delta \text{BMI-SDS}$) and 20 children (16.7%) increased BMI-SDS ($> 0.1 \Delta \text{BMI-SDS}$). No differences in baseline characteristics were observed.

Changes in VAS:

Time between the first and last VAS measurement was 26.4 months (13.9 SD). On average 2.7 VAS measurements were completed for each participant.

As outlined in Table 2, a significant decrease in bullying (0.6 median (0.0-4.7) IQR vs. 0.0 median (0.0-0.6) IQR, $p < 0.001$), and in motivation (10.0 median (9.0–10.0) IQR vs. 9.6 median (7.0–10.0) IQR, $p = 0.002$), was observed. No significant changes were found for JoL, QoL, appetite, or Bpc.

Table 2
the relative development for the 6 VAS scores for all participants, gender and weight development.

Table 2	Overall		Gender			Weight development			
	All	p-values*	Boys	Girls	p-values	Loss ↓	Stag. →	Gain ↑	p-values
N	120		56	64		81	19	20	
ΔVAS1, Joy of living	0.37 (2.12)	0.51	-0.04 (2.10)	0.73 (2.08)	0.048	0.63 (1.98)	-0.01 (2.39)	-0.31 (2.26)	0.14
ΔVAS2, Quality of life	0.22 (2.40)	0.60	0.32 (2.61)	0.13 (2.22)	0.67	0.65 (2.49)	-0.36 (1.55)	-0.96 (2.27)	0.013
ΔVAS3, Appetite	-0.46 (3.06)	0.14	-0.98 (3.22)	-0.01 (2.86)	0.085	-0.45 (3.10)	-0.17 (2.89)	-0.78 (3.14)	0.82
ΔVAS4, Bullying	-1.40 (3.18)	< 0.001	-1.23 (3.30)	-1.56 (3.10)	0.57	-1.69 (3.16)	-0.93 (3.75)	-0.67 (2.66)	0.34
ΔVAS5, Motivation	-0.78 (2.90)	0.002	-1.02 (2.93)	-0.57 (2.87)	0.40	-0.63 (2.90)	-1.41 (2.36)	-0.81 (3.37)	0.58
ΔVAS6, Body perception	0.69 (3.69)	0.27	0.29 (3.66)	1.03 (3.71)	0.28	1.14 (3.45)	0.49 (3.82)	-0.96 (4.17)	0.072

The last category is sub grouped in weight loss (< -0.1 ΔBMI-SDS), weight stagnation (-0.1 to 0.1 ΔBMI-SDS) and weight gain (> 0.1 ΔBMI-SDS). P-values refer to comparisons between the variables in each group (respectively gender and weight development). All data is reported as mean value with standard deviations (SD).

* P-values refer to comparison between the baseline VAS (table1) and the last VAS obtained (not shown).

† The relative development for VAS (Δ VAS) was calculated as the difference between baseline and at the latest obtained VAS.

¥ ΔBMI-SDS was calculated as the difference between BMI-SDS at baseline and BMI-SDS at the latest obtained VAS.

Stratified by sex, boys experienced decreased appetite (6.7 (2.3 SD) to 5.7 (2.6 SD), $p = 0.040$), bullying (0.4 median (0.0-4.8) IQR vs. 0.0 median (0.0-0.8) IQR, $p = 0.034$), and motivation (10.0 median (8.9–10.0) IQR vs. 8.9 median (6.6–10.0) IQR, $p = 0.003$). Girls experienced decreased bullying (0.6 median (0.0-4.7) IQR vs. 0.0 median (0.0-0.6) IQR, $p < 0.001$).

Children who achieved a weight loss ($<-0.1 \Delta\text{BMI-SDS}$) experienced reduced bullying (1.0 median (0.0–4.7) IQR vs. 0.0 median (0.0–0.6) IQR, $p < 0.001$) and motivation (10.0 median (9.0–10.0) IQR vs. 9.6 median (7.3–10.0) IQR, $p = 0.027$). Children without change in BMI-SDS (-0.1 to 0.1 $\Delta\text{BMI-SDS}$) experienced loss of motivation (10.0 median (9.7–10.0) IQR vs. 9.7 median (5.7–10.0) IQR, $p = 0.046$). No change was observed for those with increased BMI-SDS (data not shown).

Relative changes in VAS:

Comparing the relative changes in VAS for boys and girls, the girls JoL increased significantly ((0.73 (2.08 SD) girls) vs. (-0.04 (2.10 SD) boys), $p = 0.048$).

Children with reduced BMI-SDS increased their QoL (0.65 (2.49 SD)), compared to no change BMI-SDS (-0.36 (1.55 SD)) or increasing BMI-SDS (-0.96 (2.27 SD)), $p = 0.013$ (Table 2). Reducing BMI-SDS also increased JoL and Bpc, although non-significant ($p = 0.14$ and $p = 0.072$, respectively, Table 2), compared with children with increasing BMI-SDS.

Discussion:

The aim of the study was to evaluate different measures of QoL after a lifestyle intervention in children with obesity. With a mean follow-up of 26.4 months, the study is to our knowledge the longest follow-up on QoL after a weight loss intervention.

An overall reduction in bullying and motivation was observed. Boys experienced a reduction in appetite, bullying and motivation, while girls experienced reduced bullying and improved JoL.

Interestingly, QoL was significant improved for children who reduced BMI-SDS compared to children with no-change or increasing BMI-SDS after the intervention. Similar but non-significant trends were observed for JoL, bullying, and Bcp. The dose-dependent weight loss measured in BMI-SDS with concomitant changes in measures of QoL is to our knowledge not reported previously.

One of the strengths of our study is that all VAS scores were obtained in uniformed method with simple instruction from a small team of healthcare professionals who were specifically trained in the method.

An obvious limitation to this study is the lack of a control group. In addition, the limited number of participants increased the risk of type-2-error, exemplified by the borderline-significant results obtained.

The main purpose of the TCOCT-intervention is to reduce BMI-SDS, however, it was considered an equal success to improve QoL and thereby reduce bullying and the development of psychosocial complications later in life [1, 2].

The TCOCT intervention is used in the treatment of children with obesity in Denmark and our results add to previous findings [4], by including long-term follow-up in children who were more obese and younger. Fonvig et al. reported beneficial changes in 5 out of 6 VAS-items for children with increasing BMI-SDS. In

contrast, our study displayed children with increasing BMI-SDS to have impaired JoL, QoL, and Bcp. The discrepancies may be explained by the longer follow-up in perhaps a more real-life situation.

Conclusion:

Our multifactorial lifestyle intervention induced a long-term BMI-SDS reduction paralleled by dose-dependent improvements in QoL if a reduction in BMI-SDS was obtained.

Abbreviations

Quality-of-Life – QoL

Visual Analogue Scale – VAS

Body mass index – BMI

Standard deviation score – SDS

Joy of living – JoL

Body perception – Bpc

Declarations

Ethics approval and consent to participate:

This study was designed and conducted as a municipality-based treatment for children with obesity. At the time, when the study was designed and initiated, Danish legislation did not require registration of such of projects. Even though this trial was not a randomized study, the CONSORT-concept was followed and all procedures performed involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki Declaration. At first visit a written consent was obtained for each participant completed by a parent or a legal guardian.

Consent for publication:

Written information was handed out to the families and written consent was obtained for each participant completed by a parent or a legal guardian.

Availability of data and material:

Data will be shared on reasonable request.

Competing interests:

The authors declare that they have no competing interests. All authors completed an ICMJE “disclosure of potential conflicts of interest” form.

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Authors contributions:

JMB, EVT and RMJ conceived the original idea for the study. RMJ and RBF were responsible for data collection. RMJ analyzed data and all authors had access to the data during the process. RMJ wrote first draft of the manuscript and all authors were involved in revision and final approval of the manuscript.

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References

1. Schwimmer JB, Burwinkle TM, Varni JW. Health-related quality of life of severely obese children and adolescents. *Jama*. 2003;289(14):1813-9.
2. van Geel M, Vedder P, Tanilon J. Are overweight and obese youths more often bullied by their peers? A meta-analysis on the correlation between weight status and bullying. *Int J Obes (Lond)*. 2014;38(10):1263-7.
3. de Boer AG, van Lanschot JJ, Stalmeier PF, van Sandick JW, Hulscher JB, de Haes JC, et al. Is a single-item visual analogue scale as valid, reliable and responsive as multi-item scales in measuring quality of life? *Qual Life Res*. 2004;13(2):311-20.
4. Fonvig CE, Hamann SA, Nielsen TRH, Johansen MO, Gronbaek HN, Mollerup PM, et al. Subjective evaluation of psychosocial well-being in children and youths with overweight or obesity: the impact of multidisciplinary obesity treatment. *Quality of life research : an international journal of quality of life aspects of treatment, care and rehabilitation*. 2017;26(12):3279-88.
5. Nysom K, Molgaard C, Hutchings B, Michaelsen KF. Body mass index of 0 to 45-y-old Danes: reference values and comparison with published European reference values. *International journal of obesity and related metabolic disorders : journal of the International Association for the Study of Obesity*. 2001;25(2):177-84.

6. Jorgensen RM, Bruun JM, Kremke B, Bahnsen RF, Nielsen BW, Vestergaard ET. Sustainable weight loss over three years in children with obesity: a pragmatic family-centered lifestyle intervention. Eat Weight Disord. 2020; 10.1007/s40519-020-00887-7