

# Obesity among children and adolescents: a method for self-assessment of relevant lifestyle factors

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## Summary

A diagnostic and treatment concept has been developed and tested over the last 15 years in the pediatric obesity outpatient clinic at the *Charité Universitätsmedizin Berlin*. The concept enables patients, families and healthcare professionals to (self-)assess the daily conditions that trigger and sustain obesity and helps to build an individual treatment strategy.

This tool was also used in a clinical study. Results from patients' self-assessments, differentiated by gender, age, degree of obesity and highest level of parental education, show that patients require significant counseling on portion sizes, meal distribution, food choice and consumption of sweets. Results also show that girls assess their own mood and feelings worse than boys, that the age of adolescents has a significant influence on the assessment of media consumption and daily activity and that the consumption of sweetened beverages is significantly associated with the degree of obesity and parental education background.

**Keywords:** treatment approaches, diagnostic tool, obesity, children and adolescents, BABELUGA lifestyle monitoring map, nutrition counseling

tivity) and psycho-social factors (mood, resources and stress). In the course of further patient care and concept development, these areas were finally differentiated into nine "monitoring maps" representing possible causes of unhealthy weight development: beverages (1), portion size and food intake (2), meal frequency and "in-between eating" (3), food choice (4), daily activity (5), sports (6), media consumption: television, computer and other media (7), sweets and snacks (8), mood and feelings (9). A qualitative survey tool (see "BABELUGA Baustellen-Methode")<sup>1</sup> [2] records obesity-related factors which have a demonstrable influence on weight development [1, 3, 4]. These "monitoring maps" provide the patient concerned with a tool for self-assessment, as a basic prerequisite for methodical self-monitoring. The process of recording one's own behavior is complex and unusual [2], but indispensable for directing the search for individual approaches to change in order to stabilize and reduce weight. The so-called "tar-

## Introduction

The anamnestic retrieval of daily behavior and lifestyle conditions by the multi-disciplinary obesity team at the *Charité Universitätsmedizin Berlin* (nutritionists, psychologists and doctors) focuses on the conditions which trigger and sustain overweight and its changeability. Questions are based on the specialists' focus of individual disciplines, brought together in the *Konensusgruppe Adipositaschulung im Kindes- und Jugendalter e. V.* [Obesity Education among Children and Adolescents Participants Group] [1]. Typical problem areas which became evident in conversations with patients and families were energy intake (food and beverages), energy expenditure (movement and inac-

<sup>1</sup> BABELUGA = Berlin obesity treatment program for children and adolescents and their families; movement, advice, guidance; eating and drinking; learning and quality of life; family support; group therapy for children and parents; obesity diagnostics ["*Berliner Adipositas-Therapieprogramm für Kinder und Jugendliche und ihre Familien*"]; "Bewegung, Beratung, Begleitung; Essen und Trinken; Lernen und Lebensqualität; Unterstützung der Familie; Gruppentherapie für Kinder und Eltern; Adipositas-Diagnostik"<sup>1</sup>

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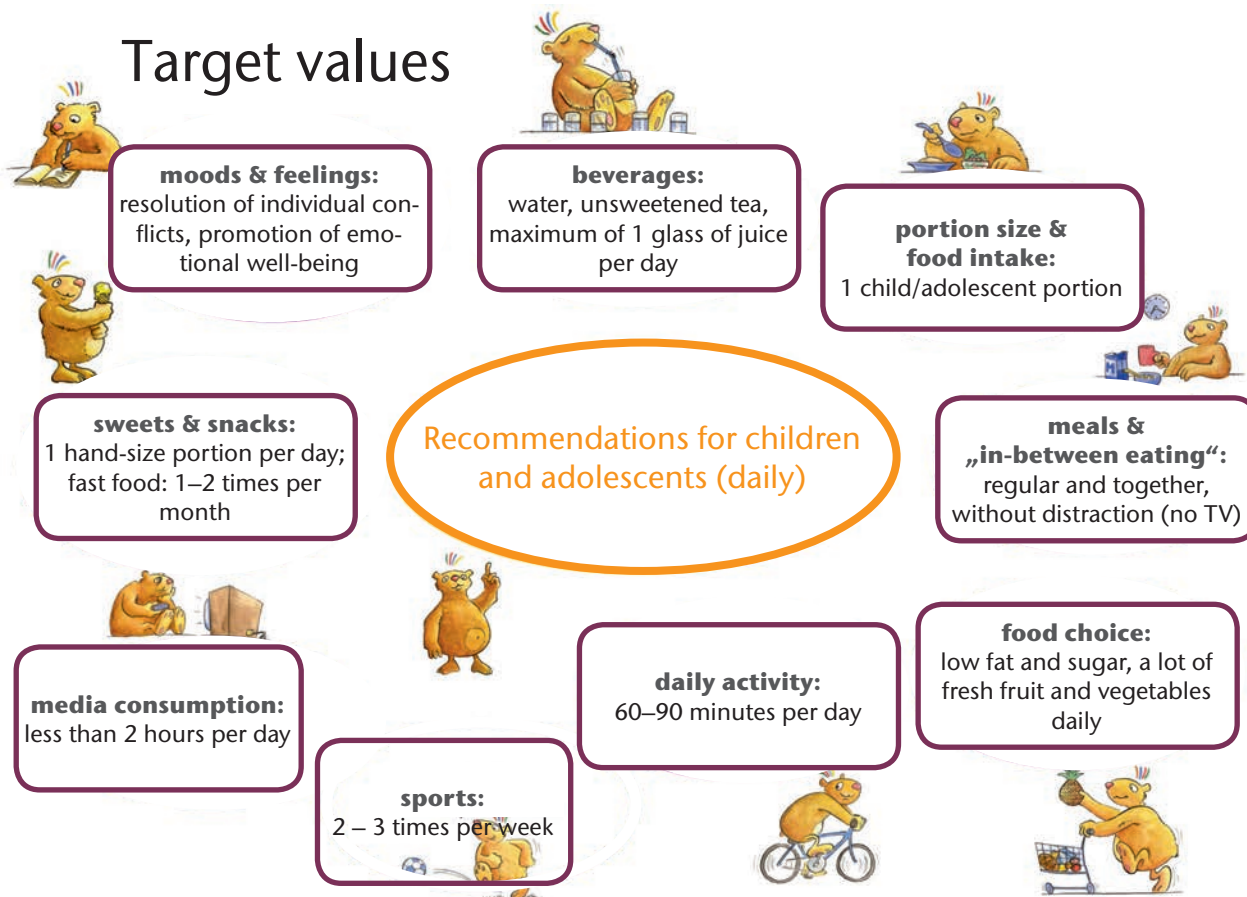


Fig. 1: „Target values“ at the obesity clinic [2]

get monitoring maps“ (♦ Figure 1) correspond to recommendations for a child-appropriate lifestyle in each individual weight-related area of life. These “monitoring maps” are assessed according to three categories (green, yellow and red) together with the patient and health care professional (examples in ♦ Table 1).

### Who actually needs what?

Obese children/adolescents and their families arrive with very different questions, experiences and expectations [5]. The spectrum of diagnostic and treatment approaches must therefore be just as varied. A detailed problem analysis and preparation of a step-by-step path to change adheres to the patient’s self-assessment (Monitoring Maps Worksheet), incorporates their perspectives and gives them

the opportunity to experience a positive feeling of empowerment, even if they have already been through many unsuccessful attempts or have no viable change motivation [2].

Obesity teams with a heterogeneous patient cohort are more capable of meeting individual requirements through an individual treatment plan and thus reduce failures and frustrations [6]. This multimodal advisory concept similar to a “modular system” incorporates a self-management approach [2, 7] and thereby extends the scope of action for parties concerned and attending professionals.

### Question

How do children and adolescents assess themselves in self-observation of weight-related areas of life such as diet/food, movement/inactivity

and psycho-social state within the nine BABELUGA lifestyle monitoring maps? Are the conditions triggering and sustaining the weight problem illustrated thereby? Do differences appear in self-assessment according to gender, age, degree of obesity, and parental level of education, and can specific treatment approaches be derived therefrom?

### Methodology

The so-called *Maintain-Studie-Kinder/Jugendliche* [Maintain Study Children/Adolescents] has been conducted among obese children and adolescents at the *Charité Universitätsmedizin Berlin* since 2009 as part of the *Klinische Forschungsgruppe (KFO)* [Clinical Research Group] 218/1 of the DFG (*Deutsche Forschungsgemeinschaft*) [German

Monitoring map	green: target value	yellow example	red example
beverages	water, unsweetened tea, maximum of 1 glass of juice per day	water, but also sweetened beverages such as flavored water or too much juice per day	no water, instead iced tea, soft drinks and juices
portion size & food intake	child/adolescent portion, good self-assessment	sometimes too many portions; correct assessment of correct portion size is apparent	portions always too large or too many portions; no assessment of correct portion size
meals & „in-between eating“	regularly five meals per day, shared meals in the family, e.g. in the evening, no media consumption while eating	sometimes skipping breakfast, school snack is eaten, but is insufficient, snacks prompted by ravenous appetite, hot midday meal in canteen is not always consumed/eating only in the afternoon at home, eating in front of the television	no breakfast, school snack consumption irregular, snacks at school, hardly any shared meals, eating between meals and snacks in the afternoon prompted by ravenous appetite, hot meal only in the evening at home, eating in front of the television
food choice	low fat and sugar, fresh fruits and vegetables daily	rarely vegetables and little fruit	family meals contain a lot of pre-prepared food, cooking is rare
daily activity	60–90 minutes per day, active leisure time with friends	cycling to school or home from school, getting off the bus a few stops earlier and walking, sometimes out with friends	school ride with car/bus/train; physically inactive in the afternoons, strong media use
sports	2–3 times per week	regularly once a week to sports in club or participation in school physical activities	no sports club or other sporting activity
media consumption	less than 2 hours per day	television/watching films on internet > 2 hours per day, plus playing on computer or consoles, tablets, smartphones, chatting; but there are other interests and ideas for leisure activities which are implemented	television is always on, plus surfing on the internet: watching films/videos, chatting; games on computer or console, tablets, smartphones, alone or with others; no ideas for alternative leisure activities
sweets & snacks	1 hand-size portion per day; fast food: 1–2 times per month	can usually ration snack portions, but sometimes still too many sweets/salty snacks	no measure of snack portion size; unrestrained nibbling of sweets or salty snacks, including to regulate moods
mood & feelings	ability to solve individual conflicts, ability to self-regulate in relation to emotional well-being	psycho-social stress triggers are perceived, dysfunctional regulation of emotions through eating and/or media consumption cannot always be countered	psycho-social stress triggers are not recognized, dysfunctional regulation of emotions through eating and/or media consumption

Tab. 1: Possible interpretations for red, yellow and green based on target monitoring maps in ♦ Figure 1

Research Foundation] (<http://adipositas.charite.de/>). A total of 137 children and adolescents (aged 10 to 17 years-of-age) were randomized according to standardized weight reduction [8].

During an initial examination, the study patients undertook self-assessment of the BABELUGA lifestyle monitoring maps using the traffic light model (target recommendations ♦ Figure 1). By means of traffic light colors, patients and parents assessed the areas they regarded as unproblematic (green = already quite good, e.g. "I drink a lot of water"), as somewhat problematic (yellow = not so good, e.g. "I put a lot on my plate") and as particularly problematic (red = I still need to change a lot, e.g. "I sit in front of the television every day for four hours"). Two age groups were formed based on date of birth and time of examination: ages 10 to 13 years-of-age and ages

14–18.

The BMI-SDS (Body-Mass-Index-Standard-Deviation-Score) was calculated according to reference values [9] for height, weight and age from measured data taken with calibrated scales and stadiometer. Two categories were established: BMI-SDS < 2.5 (moderate obesity) and BMI-SDS ≥ 2.5 (extreme obesity).

The parental education level was determined through a standardized questionnaire and used for assessment of the highest school-leaving qualification in the household. Three categories were established: 1 = low (no qualification or *Hauptschulabschluss*), 2 = intermediate (*Realschulabschluss*) and 3 = high level of education (*Hochschulreife*).

130 study participants were included in the analyses (the monitoring maps self-assessment missed for seven). Group comparisons were

conducted with the Mann-Whitney U Test for two groups (gender, age, BMI-SDS) and with the Kruskal-Wallis Test for three groups (highest level of education of parents). The significance level was 0.05. Data processing was carried out using statistics software SPSS 21.0.

## Results

♦ Figure 2 shows the nine areas of self-assessment in the categories of green, yellow and red for all study participants in percentages. 46.9 % of children/adolescents assess their consumption of sugary beverages as unproblematic (only water). Regular sport and daily activity are regarded as unproblematic (green) by 36.2 % and 33.1 % of children/adolescents. Mood and feelings is described as good (green) by 34.6 % of patients.

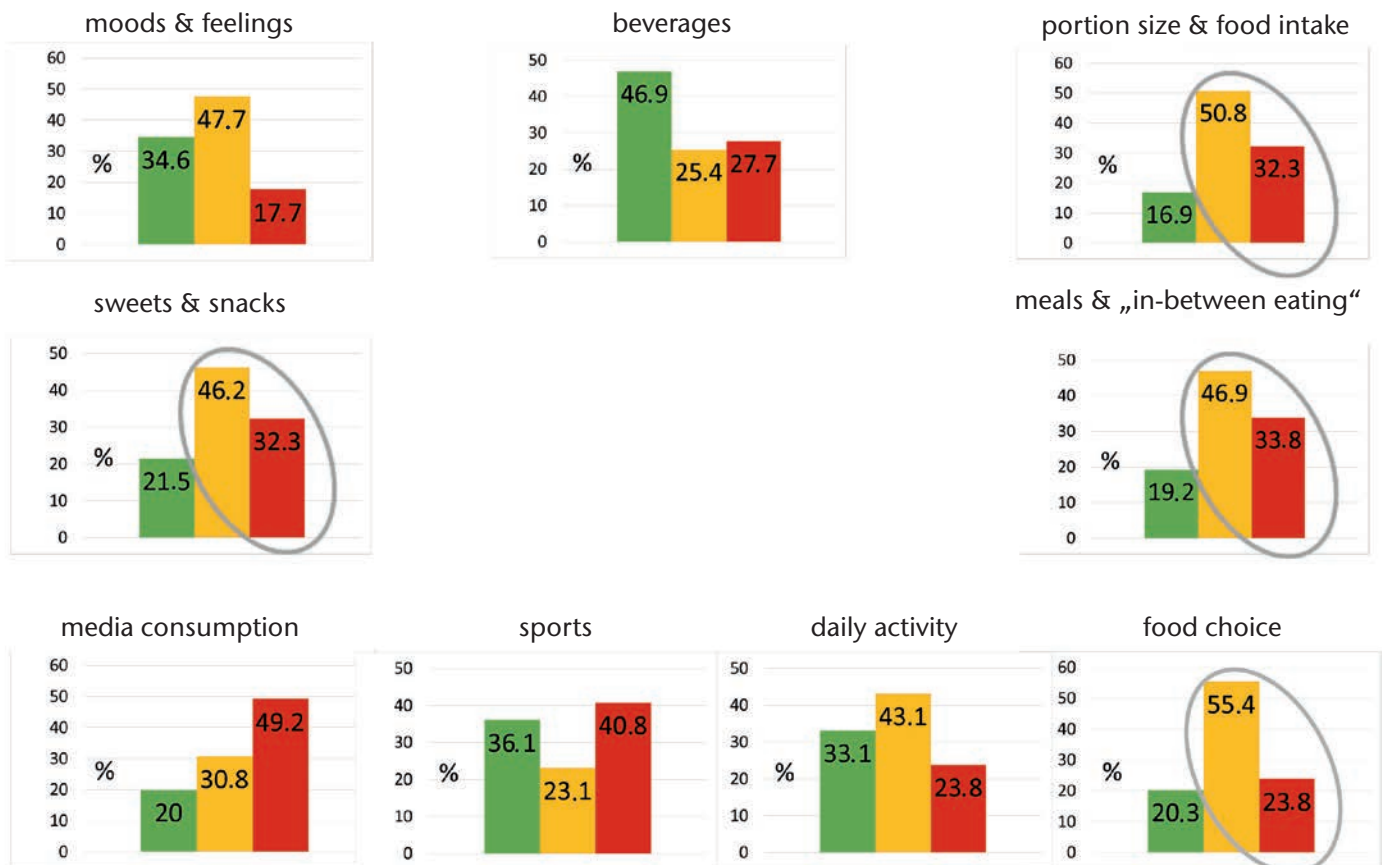


Fig. 2: Frequency distribution (%) of self-assessment (green, yellow, red) by entire patient cohort per monitoring map (n = 130)  
encircled = signals need for counseling

Initial examination BABELUGA lifestyle monitoring map (%)	male	female	p-value
	n = 61	n = 69	M-W
<b>beverages</b>			
green	44.3	49.3	
yellow	23	27.5	0.356
red	32.8	23.2	
<b>portion size &amp; food intake</b>			
green	11.5	21.7	
yellow	52.5	49.3	0.167
red	36.1	29	
<b>meals &amp; „in-between eating“</b>			
green	19.7	18.8	
yellow	45.9	47.8	0.972
red	34.4	33.3	
<b>food choice</b>			
green	19.7	21.7	
yellow	54.1	56.5	0.575
red	26.2	21.7	
<b>sweets &amp; snacks</b>			
green	18	24.6	
yellow	44.3	47.8	0.187
red	37.7	27.5	
<b>media consumption</b>			
green	19.7	20.3	
yellow	27.9	33.3	0.580
red	52.5	46.4	
<b>daily activity</b>			
green	39.3	27.5	
yellow	41	44.9	0.134
red	19.7	27.5	
<b>sports</b>			
green	45.9	27.5	
yellow	18	27.5	0.082
red	36.1	44.9	
<b>moods &amp; feelings</b>			
green	44.3	26.1	
yellow	41	53.6	0.047
red	14.8	20.3	

Tab. 2a: Percentage frequency distribution of BABELUGA lifestyle monitoring map (green, yellow, red) among children and adolescents (aged 10–17 years-of-age, n = 130) stratified according to gender  
M-W = Mann-Whitney-U-test

The most common problems are in the area of media consumption (red 49.2 %). When red and yellow assessments are combined as unfavorable, then portion sizes and food amount are regarded as too large by 83.1 %, 80.7 % assess their meal distribution during the day as unfavorable and 79.2 % report an unfavorable food choice in the household. 78.5 % of children and adolescents eat more than a handful of sweets and/or snacks per day.

There is a significant difference in the assessment of mood and feelings by gender (♦ Table 2a). Girls have a worse regard of their emotional state (yellow/red 74 % compared to yellow/red 56 % for boys).

When children and adolescents are differentiated according to age (under 14s and over 14s) (♦ Table 2b), there are significant differences in self-assessment of daily activity (< 14s, yellow/red: 65 % compared to ≥ 14s: 79 %) and media consumption (< 14s: 72 % compared to ≥ 14s: 88 %).

There is a significant difference in assessment of sugary beverage consumption by obese (< 2.5 BMI-SDS) and extremely obese (≥ 2.5 BMI-SDS) children/adolescents (BMI-SDS < 2.5: red 13.8 % versus BMI-SDS ≥ 2.5: 41.5 %) (♦ Table 2c).

The stratification of patients according to parental highest level of education (♦ Table 2d) shows a significant difference in self-assessment of beverage consumption with a gradient from the low level of education to the higher level of education (31.8 %: green versus 57.4 %: green).

### Discussion and conclusions for treatment therapy

The monitoring map worksheet (♦ Figure 2) impressively shows how differently the children and adolescents concerned assess their own behavior in relation to the three obesity-related areas of energy intake, energy expenditure and psychological factors of influence.

## Energy intake (diet/food)

The subject of food & beverages can be examined individually in more detail in the guided interview in five monitoring maps (beverages, portion sizes and food intake, meal distribution, food choice, sweets and snacks consumption). Patient behavior in four out of five food and nutrition monitoring map [2, 3, 10] – portion size and food intake, meal distribution, food choice, sweets and snack consumption – is assessed by the entire patient cohort (> 80 %) as unfavorable (red and yellow), without significant differences in stratification groups. This contradicts the clinical impression that younger children have a better meal time structure in comparison to older children, and that unfavorable food choice and higher sweet and snack consumption indicates extreme obesity.

In regard to the treatment plan, it can be concluded that all patients concerned require counseling in this area. Therefore, counseling on nutrition-related areas must be provided in all groups, before individual focal points can be further explored in conversation [11–15].

Significant differences were determined in the area of energy intake only in relation to unfavorable beverage consumption [16, 17], which is a primary condition for unfavorable weight development for extremely obese patients and in families with a lower level of education. This is recognized by some patients (self-assessment: red), but possibly not by others (self-assessment: green) or was already changed (self-assessment: green). In families with lower levels of education among parents the consumption of sugary beverages appears to be higher.

### Importance for Intervention:

(Psychological) education in relation to sugary beverages is extremely important in the consultation. Pa-

Initial examination BABELUGA lifestyle monitoring map (%)	< 14 years-of-age n = 64	≥ 14 years-of-age n = 66	p-value M-W
<b>beverages</b>			
green	39.1	54.5	0.054
yellow	26.6	24.2	
red	34.4	21.2	
<b>portion size &amp; food intake</b>			
green	12.5	21.2	0.468
yellow	54.7	47	
red	32.8	31.8	
<b>meals &amp; „in-between eating“</b>			
green	21.9	16.7	0.283
yellow	48.4	45.5	
red	29.7	37.9	
<b>food choice</b>			
green	17.2	24.2	0.432
yellow	57.8	53	
red	25	22.7	
<b>sweets &amp; snacks</b>			
green	21	21.2	0.421
yellow	40.6	51.5	
red	37.5	27.3	
<b>media consumption</b>			
green	28.1	12.3	0.004
yellow	34.4	27.3	
red	37.5	60.6	
<b>daily activity</b>			
green	45.3	21.2	0.008
yellow	35.9	50	
red	18.8	28.8	
<b>sports</b>			
green	40.6	31.8	0.326
yellow	21.9	24.2	
red	37.5	43.9	
<b>moods &amp; feelings</b>			
green	35.9	33.3	0.466
yellow	50	45.5	
red	14.1	21.3	

Tab. 2b: Percentage frequency distribution of BABELUGA lifestyle monitoring map (green, yellow, red) among children and adolescents (aged 10–17 years-of-age, n = 130) stratified according to age group

M-W = Mann-Whitney-U-test

Initial examination BABELUGA lifestyle monitoring map (%)	< 2,5 BMI-SDS n = 65	≥ 2,5 BMI-SDS n = 65	p-value M-W
<b>beverages</b>			
green	52.3	41.5	
yellow	33.8	16.9	0.017
red	13.8	41.5	
<b>portion size &amp; food intake</b>			
green	15.4	18.5	
yellow	55.4	46.2	0.744
red	29.2	35.4	
<b>meals &amp; „in-between eating“</b>			
green	23.1	15.4	
yellow	44.6	49.2	0.419
red	32.3	35.4	
<b>food choice</b>			
green	29.2	12.3	
yellow	49.2	61.5	0.07
red	21.5	26.2	
<b>sweets &amp; snacks</b>			
green	23.1	20	
yellow	50.8	41.5	0.213
red	26.2	38.5	
<b>media consumption</b>			
green	24.6	15.4	
yellow	29.2	32.3	0.303
red	46.2	52.3	
<b>daily activity</b>			
green	36.9	29.2	
yellow	43.1	43.1	0.246
red	20	27.7	
<b>sports</b>			
green	41.5	30.8	
yellow	24.6	21.5	0.109
red	33.8	47.7	
<b>moods &amp; feelings</b>			
green	41.5	27.7	
yellow	43.1	52.3	0.123
red	15.4	20	

Tab. 2c: Percentage frequency distribution of BABELUGA lifestyle monitoring map (green, yellow, red) among children and adolescents (aged 10–17 years-of-age, n = 130) stratified according to level of obesity  
 BMI-SDS = Body-Mass-Index-Standard-Deviation-Score; M-W = Mann-Whitney-U-test

tients should be informed that a lot of energy is taken on with sugary beverages, without satiety. The importance of sugary beverages in the peer group and/or family should also be addressed. Children/adolescents and guardians should be encouraged to consume unsweetened beverages. Self-monitoring should be improved and the altered experience of hunger/appetite/satiety should be observed. This measured self-assessment confirms the clinical impression of the beverages monitoring map as a relevant “entry monitoring map”. The changeability of family beverages consumption often indicates whether a family has sufficient motivation and resources to change their behavior in other relevant monitoring maps.

**Energy expenditure (movement vs. inactivity)**

This area comprises three monitoring maps: sport (e.g. in a club), daily movement, and media consumption (as a measure of inactivity) [18]. Against the backdrop of the recommendations (♦ Figure 1) 40–50 % of adolescents assess themselves as red in this area. Significant differences were determined in media consumption and daily activity, which are certainly primary conditions of unfavorable weight development among adolescents from the age of 14 [19]. Life for adolescents over 14 years-of-age changes rapidly. Emotional instability and physical change processes begin during puberty. The social peer group and the school environment are a challenge for obese children. According to current figures opportunities of media consumption are used excessively by this age group. This has an impact on daily activity; we can clearly see that children move more in comparison to adolescents (45 % versus 21 % green), possibly also as a result of more opportunities in primary school.

### Importance for intervention:

In keeping with the changing reality of life during puberty, age- (and gender-) appropriate sport and movement opportunities should be made available. The patients concerned and their families are thereby encouraged to integrate movement into the (family's) daily routine and to develop an active lifestyle. More movement opportunities at school would be useful for situational prevention.

Development of media competence is an important task for school and home. Pros and cons should be understood as well as the emotion-regulatory effect of media. Improved self-regulation should lead to an increase in activity and reduction of inactivity on a daily basis. For adolescents a favorable change in sporting activity and daily movement is most successful if the need for social integration in the peer group is also considered.

### Psycho-social factors of influence

#### (mood/resources/stress)

The area of mood/resources/stress is represented by a "mood and feelings monitoring map" which looks closer at the individual issues reported. The influence of moods and feelings on the other monitoring maps are also discussed (e.g. sweets consumption for stress coping, eating between meals due to boredom, television for relaxation). Girls assess the influence of their emotional state on their own eating behavior and activity level and thus on weight development more clearly than boys and can express this better through the worksheet [20–22].

### Importance for intervention:

Girls in particular should be assisted to explore the psychological functionality of eating/nutritional and movement behavior. Boys should be given expressive opportunities appropriate to age and gender, so that they also can gain an insight

Initial examination BABELUGA lifestyle monitoring map (%)	low education level	intermediate education level	high education level	p-value
	n = 22	n = 53	n = 54	K-W
<b>beverages</b>				
green	31.8	41.5	57.4	0.048
yellow	27.3	26.4	24.1	
red	40.9	32.1	18.5	
<b>portion size &amp; food intake</b>				
green	36.4	9.4	16.7	0.181
yellow	31.8	52.8	55.6	
red	31.8	37.7	27.8	
<b>meals &amp; „in-between eating“</b>				
green	31.8	18.9	14.8	0.232
yellow	45.5	45.3	48.1	
red	22.7	35.8	37	
<b>food choice</b>				
green	22.7	11.3	29.6	0.131
yellow	54.5	60.4	50	
red	22.7	28.3	20.4	
<b>sweets &amp; snacks</b>				
green	18.2	18.9	24.1	0.543
yellow	50	43.4	48.1	
red	31.8	37.7	27.8	
<b>media consumption</b>				
green	22.7	26.4	13	0.705
yellow	31.8	24.5	37	
red	45.5	49.1	50	
<b>daily activity</b>				
green	22.7	41.5	29.6	0.224
yellow	50	39.6	42.6	
red	27.3	18.9	27.8	
<b>sports</b>				
green	22.7	37.7	40.7	0.68
yellow	36.4	18.9	20.4	
red	40.9	43.4	38.9	
<b>moods &amp; feelings</b>				
green	27.3	43.4	29.6	0.403
yellow	54.5	39.6	51.9	
red	18.2	17	18.5	

Tab. 2d: Percentage frequency distribution of BABELUGA lifestyle monitoring map (green, yellow, red) among children and adolescents (aged 10–17 years-of-age, n = 130) stratified according to highest level of education

K-W = Kruskal-Wallis-test



into dysfunctional emotion regulation strategies and develop behavioral alternatives.

### Limitations

The BABELUGA lifestyle monitoring map worksheet is an interactive survey and treatment tool and thus produces no data independent of the researcher. The worksheet enables healthcare professionals to explore the daily routine of patients in conversation and to modify it through behavioral homework. They thereby become co-designers of the path to change.

### Conclusion

The long-term objective of obesity treatment is the stabilization of a favorable diet and movement behavior in terms of a lifestyle change with improved physical functions and social participation. The prerequisites for this behavioral change are improved self-awareness, increased self-control and the retrieval of the experience of empowerment. Patients and their families are experts on their own account and in the process of working on the monitoring maps they lose their narrow view of the "weight" problem and extend their scope of action for a healthy lifestyle. Alongside self-observation the patient is gradually led to make practical changes of unfavorable habits and to stabilize new behavior in the daily routine [23].

#### Conflict of Interests

Dr. BAU, Ms. ERNERT, Ms. ERNST and PD Dr WIEGAND are employed at the SPZ and at the Institut für Experimentelle Pädiatrische Endokrinologie [Institute for Experimental Pediatric Endocrinology] at the Charité Universitätsmedizin Berlin.

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