Psychological Indications, Contraindications, And Follow-up To Bariatric Surgery

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Elisabeth Ardelt-Gattinger
Department of Psychology, Paris Lodron University, Salzburg, Austria;
Obesity Academy Austria

Erich Gattinger
Department of Psychology, Paris Lodron University, Salzburg, Austria;
Obesity Academy Austria

Daniel Weghuber
Assoc. Professor (Priv. Doz.) of Pediatrics
Department of Pediatrics

Bariatric surgery for adolescents

Children and adolescents today show "the same aversion to overweight children and adolescents" as was found in a 1961 study (1). Adolescents are especially at risk for forming these negative opinions during puberty. During this time, high emotional instability leads to vulnerability in personal, sexual, and social development (2, 3). Various studies indicate that mental disorders such as phobias and depressions are more likely to be the result of obesity rather than the cause, but a bidirectional association has also been demonstrated (4, 5). Caregivers worry about the fact that the instability of puberty itself may lead to wrong decisions about the type of surgical intervention and to inadequate evaluation of the post-operative, long-term consequences of bariatric interventions.

In this chapter we present a review of the literature followed by the results of studies we performed in order to improve the evaluation, care and follow-up of obese adolescents searching for bariatric surgery.

Pre-surgical evaluation

Because bariatric surgery has not been fully accepted as treatment for obesity among adolescents, most studies to date include adult subjects. In contrast to patients evaluated for other life-prolonging and health-ensuring surgical measures, bariatric surgery candidates are subjected to psychological or psychiatric evaluation to determine surgical eligibility (6).
Obesity is recognized as an illness that makes obese people unable to attain long-term weight control using traditional methods due to numerous reasons (7). Nevertheless, obese people are targeted for "assessment of psychopathology and personality examination" by psychosomatic specialists (8). Even recently published work points to hypochondria, anxiety, intelligence level, depression, and obsessive-compulsive disorder as contributing factors for obese adults and teenagers (9).

Preferred assessment instruments include the Minnesota Multiphasic Personality Inventory or the Minnesota Clinical Multiaxial Inventory (MMPI, MCMI) and the Personality Assessment Inventory (PAI) (8-11). Despite extensive testing conducted since the 1960s by Stunkard & Wadden (12), Latner & Stunkard (13) and Pudel & Westenhöfer (14) to develop questionnaires identifying specific eating behaviors, the personality instruments remain in widespread use. To date, empiric evidence is lacking to support the need for a special preoperative psychopathology assessment for obese patients (15,16). Instead, accumulated evidence suggests that these evaluations are "simply insufficient" to predict surgical success, sufficient weight-loss, improved comorbidities, or improved quality of life (17-20).

Testing protocols have been supplemented by clinical interviews that provide ambiguous responses. For instance, clinical interviewers are charged with assessing patients for "factors potentially (sic) disturbing the effectiveness" (21) of surgery that "might (sic) influence post-OP weight loss" (22). Moreover, popular psychoanalytical questions refer to the "psychological firewall, which the fat offers" (23). The Boston Interview for Gastric Bypass, whose criteria are highly disputable, has been implemented for pre-operative assessment (24).

Moreover, scientific investigations show that a desire to get approval for surgery leads to false answers during the clinical interview. In a study of second inquiry, after a psychologist had granted patients

"clearance" for surgery, the severity of depressions rose significantly (25).

In summary, Walfish et al. (26) asserted that pre-surgical instruments and examination practices vary widely between psychologists. The published literature is often contradictory and "far from conclusive" regarding predictors of bariatric post-operative success (27). Some authors have strongly advised that studies regarding "variability in clinical decision making" be performed (28).

The inconsistency in evaluation methods notwithstanding, psychological factors during the radical change in lifestyle accompanying bariatric surgery should not be dismissed. Although post-operative measures are more relevant to post-surgical therapy, a pre-operative visit is necessary to evaluate the patient for pre-operative testing and decide on the most appropriate surgical method.

Mental disorders strongly associated with obesity that manifest with symptoms of disturbed eating behavior should also be investigated. Binge eating disorder is prevalent in 30% of adults and 24% of teenagers, whereas bulimia is prevalent in 7% of adults and 6% of teenagers in a representative Austrian sample of 540 obese teenagers and 1200 obese adults. Including the detection of pre-clinical eating disorders (pre-occupation with weight and shape as well as pre-clinical bulimia), which were prevalent in 30% of teenagers of the same sample, is especially important (17).

Instruments used to evaluate pre-surgical psychological disorders and phobias relevant to pediatric obesity, as recommended in an ECOG position paper (29), are listed in Table 1.

Subscales testing a psychological Model	M1 Binge eating	M2 Dietary restraint	M3 Emotional eating	M4 Responsiveness to food cues	M5 Family pathology	Mental problems
Parent+child						
DEBQ*	x	x	x	x		
CBCL*			x			x
Child measures						
EDE-Q*	x	x				
cheat*	x	x				
EDI*	x	x				
BIS/BAS*				x		
SPPC*			x			x
CDI*			x			x
EDE	x	x				
KID-SCID			x			x
STROOP				x		
Parental measures						
CFQ*					x	
Parental rejection*					x	

Table 1: Scales and Subscales testing psychological factors relevant in pediatric obesity assessment

Research studies focusing on cognitions that control eating and movement patterns pre and post obesity surgery are highly needed. First and foremost, the scientifically well-documented addictive aspect of overeating among obese people (30) must be investigated. Addiction in this context means food craving and dependence on overeating (31).

However, this is particularly difficult, firstly because of ever-present food advertising and easy food availability in a society of excesses, and secondly because it leads to a so-called “ironic process,” in which the craving is curbed by inhibitory control characterized by an excessive occupation with not eating. Forbidden foods are banned from the memory, but they acquire a special neuronal importance, such that they are marked as target stimuli in memory search processes. This paradoxically leads to higher availability of the repressed content: thoughts and mental images of forbidden foods are amplified (32). Thus, the alternative approach is to represent salutogenic thoughts and behaviors. This salutogenetic approach puts the balance of good problem-solving ability and self-confident handling of problems as healing factors in opposition to the pathogenic context of control, often called ‘restraint eating’ (cf. 33, among others). So, for instance, thoughts of unfavorable foods ("I will absolutely not eat this chocolate",

"I must not eat that", and so on) should not be suppressed. Instead these thoughts should be replaced by dietician-formulated sentences like "Everything is allowed in small portions ... " or "I have an appetite for chocolate – I can eat fruit salad with chocolate sprinkles." The effectiveness of the mentioned healing factors is proven in the area of adiposity research (cf. 34, among others) and also proven as being preventive in studies on eating disorders (cf. 35, among others). Moreover, Kärenen states that more attention must be paid to health-promoting factors in research on eating disorders and obesity (36).

Important aspects for salutogenic eating behavior are “flexible steering of eating behavior”, “hedonic eating”, “adherence to recommendations of nutrition experts”, the “ability to put suggestions concerning exercise and diet into practice”, “nutritional preferences” for healthy instead of fatty food, and “extrinsic” and “intrinsic sports motivation” (17) to pursue health-enhancing physical activity.

Experts and representatives from the International Federation for the Surgery of Obesity – European Chapter (IFSO-EC), European Association for the Study of Obesity (EASO), and EASO’s Obesity Management Task Force (OMTF) issued an international guideline in 2013 at the European Congress on Obesity (ECO) on pre-bariatric surgical requirements for children and youth which explicitly provide not only medical but also “psychological” evaluation (see point 4) and a “post-operative multidisciplinary program”.

Table 2: Interdisciplinary European guidelines on metabolic and bariatric surgery (6).

In adolescents with severe obesity, bariatric surgery can be considered if the patient has the following characteristics:

1. Has a BMI > 40 kg/m2 (or 99.5th percentile for respective age) and at least one co-morbidity
2. Has followed at least 6 months of organized weight reducing attempts in a specialized clinic
3. Shows skeletal and developmental maturity
4. Is capable to commit to comprehensive medical and psychological evaluation before and after surgery
5. Is willing to participate in a post-operative multidisciplinary treatment program (This aspect especially differs from the specific guidelines for adults.)
6. Can access surgery in a unit with specialist pediatric support (nursing, anaesthesia, psychology, post-operative care)

These patients with BMI ≥ 40 kg/m2 and BMI 35–40 kg/m2 with co-morbidities in which surgically induced weight loss is expected to improve the disorder (such as metabolic disorders, cardiorespiratory disease, severe joint disease, obesity-related severe psychological problems) gain permission for surgery. Furthermore, weight loss as a result of intensified treatment before surgery (patients who reach a body weight below the required BMI for surgery) is not a contraindication for the planned bariatric surgery. The same applies to patients who exhibited a substantial weight loss in a conservative treatment program but started to gain weight again. For children and adolescents, bariatric surgery is only permitted to be carried out in clinics "with extensive experience" of such treatment in adults and who are able to offer a true multidisciplinary approach, which involves pediatric skills relating to surgery, dietetics and psychological management (6).

Bariatric surgery for genetic syndromes such as Prader-Willi syndrome require the same criteria to be met, including careful consideration of an expert medical, pediatric, and surgical team (6).

Evaluation of bariatric surgery risks and benefits

Recommendations resulting from studies evaluating bariatric surgery for adolescents are often based on outdated personality models (8, 9, 37). Thus, some of their findings are questionable. Hence, Felix et al. (8) showed that patients' mental status improved remarkably within 6 to 33 months after a phobia or depression diagnosis even before surgery. Parikh et al. (39) found no differences regarding weight reduction between patient groups requiring no pre-operative therapy and those for which pre-operative therapy was obligatory. Loux (40) then found evidence that quality of life for morbidly obese adolescents, who claimed to have the same quality of life as those suffering from cancer, significantly rose after surgically-induced weight loss.

In a meta-analysis of 23 studies conducted between 1955 and 2013 (637 patients; gastric band, sleeve gastrectomy, gastric bypass, or biliopancreatic diversion), Black et al. (41) reported that surgical

interventions led to a 13.5 kg weight loss within one year and reduced comorbidities. However, it has been argued that possible complications were not properly defined in the selected studies. Jen et al. (42), Michalsky et al. (43), and Inge et al. (44) suggest that the healing process, the subsequent reduction in co-morbidity rate, and post-surgical complications for adolescents are comparable to those experienced by adults. Because of unsatisfactory results, more thoroughly documented long-term studies and guidelines have been recommended.

Although "few studies have been conducted in accordance with scientifically sound criteria", Treadwell et al. (45) found a trend toward significant weight loss. However only 13% of study participants adhered to both the food and physical activity instructions.

In general, post-operative treatment adherence requires tighter observation for adolescent patients because of the frequency of high-caloric food consumption that may lead to complications and failure (9, 46-48). Some authors are less concerned about pre-operative weight loss predictors and more concerned about post-operative factors influencing treatment success. Rather than general guidance for post-operative therapy, these authors propose an exact evaluation of medical and psychological problems, including eating disorders and disadvantageous or emotionally-induced urges to eat (49-52).

Surgical method and post-operative care, as well as sociodemographic factors like income and education (53), should be considered when evaluating the success of bariatric surgery (15). Pull (54) suggests that the psychological effects of surgery should be investigated to identify factors that affect post-operative weight loss, change in medical comorbidities and quality of life.

With respect to the "Health at any size" campaign (55) that gained popularity in 2001, variables influencing eating habits and health-enhancing physical activities deserve evaluation (56) because patients are still obese or overweight following surgery (57). Although the 1995 SOS study (58) achieved an interdisciplinary approach (59) by operationalizing short scales, research has not been significantly developed. Even the scientifically grounded "Kieler Adipositaspraeventionsstudie" (Kieler Obesity-Prevention Study) (60), which included medical data evaluation, eating habits, and physical activity behavior, failed to change the unsatisfactory standard of requiring interdisciplinary diagnostics and post-surgical evaluation. Fenton (61) notes the relative absence of scientific studies about eating disorders and obesity focusing on salutogenesis over avoidance strategies (62).

If standardized tests were to show that bariatric surgery could benefit patients not only with respect to weight, but also with respect to long-term changes in attitude and behavior regarding eating habits and physical activity, it would gain status as a health-promoting therapy.

A prospective study on interdisciplinary evaluation of pre- and post-operative bariatric surgery conditions

To investigate the pathogenic and salutogenic effects of bariatric surgery on interdisciplinary health, the authors conducted a representative study of 6600 adults and 4400 subjects aged 8 - 18 with a newly developed interdisciplinary instrument (AD-EVA, Adiposity evaluation) based on existing procedures (12, 14, 63, 64); new salutogenically formulated questionnaires (17) were added. Test criteria were determined and items meeting the criteria were selected. Table 3 provides content, example items and test quality information for each questionnaire or subscale.

Table 3. Questionnaire, subscales, and statistical characteristics of the AD - EVA (Adiposity Evaluation): Interdisciplinary test system for the diagnosis and evaluation of obesity and other diseases influenced by eating habits and physical behavior, with two sample items.

Quest.	Subscales	Internal Consis-tency	Re-test	Examples of Items	Diff. Per-centiles
QPEC	Control	0.82	0.90	…Conscious of my weight I often try to eat nothing between meals. …I choose to eat only low-calorie food…	Sign & substantial
	Disinhi-bition	0.85	0.88	…Whenever I pass a bakery, I want to buy something delicious. …If I have something delicious to eat, I would prefer to eat it immediately.	Significant
	Emotional eating	0.89	0.73	…I always want to eat when I have nothing to do…When I'm depressed, I have a great appetite for food.	Significant
QSEC	Cognitions about exercising	0.86	0.78	…I try to fit exercise into my daily life (by taking stairs instead of…)	Sign & substantial
	Putting sugges-tions into practice	0.70	0.83	…My food is varied and well balanced…I try to eat fruit and vegetables as often as possible	Significant
QATO	Craving and depen-dency	0.86	0.78	…Craving for food can make me obsessed…I have to eat/snack a lot to be able to relax or go to sleep…	Sign & substantial
QPED	Preoc-cupied with weight and shape	0.84	0.76	…I feel I am fat …I think diets are very good for losing weight…	Sign & substantial
	Preclinical bulimia	0.82	0.80	…Sometimes I vomit after I eat a large meal because I do not want to gain weight…	Sign & substantial
QCED	Binge eating disorder	0.77	0.81	…I consume a large amount of food within a short period of time. …I have these eating attacks at least twice a week…	Sign & substantial
	Bulimia	0.82	0.83	After these attacks I make myself vomit, take laxatives, watering pills or exercise…	Sign & substantial
QL	Quality of Life Scale	0.73	0.85	…It annoyed me that I could not eat… I was often sad that I was teased about my figure…	Sign & substantial
QEM	Intrinsic Exercise Motivation	0.84	0.88	…If I exercise it's because I enjoy it… …because I can be with others	Significant
	Extrinsic	0.75	0.89	…If I exercise it's because I want to	Significant

	Exercise Motivation			lose weight…	
SNP	Snacks	0.90	0.88	…I like …cakes or pie …sweet/salty snacks	Sign & substantial
	Healthy food	0.83	0.89	…I like fruits…low-fat cheese... …vegetables	Sign & substantial
	Fatty foods	0.77	0.79	…I like Mayonnaise …fat sausage …French fries	Sign & substantial

QPEC Questionnaire on pathogenic eating cognitions; QSEC Questionnaire on salutogenic eating cognitions; QATO Questionnaire on addiction to overeating; QPED Questionnaire on preclinical eating disorders; QCED Questionnaire on clinical eating disorders; QL Questionnaire on quality of life; QEM Questionnaire on exercise motivation; SNP Scale of nutrition preferences (62).

Assessment was performed pre-operatively and 18 to 24 months post-operatively. Because gastric banding (GB) and gastric bypass (GBP) are the most commonly performed bariatric surgical procedures (59) and they require different post-operative behavioral adaptations, we compared these two methods. Questionnaires were given to 120 patients (33 males and 87 females, aged 16 to 65 years) with morbid obesity (BMI 45.70 ± 6.30 kg/m²) pre-surgery and post-surgery (*M*=26.8 months). Eighty patients (22 males and 58 females, aged 41.2 ± 11.6 years) underwent gastric bypass surgery and 40 underwent gastric banding surgery. Eight (4 male and 4 female) participants with gastric banding were aged 16 to 18 (pre-operative BMI standard deviation score (BMI_SDS): 3.55 ± 0.44); 24 months post-operatively.

Pre-operatively, no variables regarding eating habits, motivation to exercise, or eating disorders impacted the post-surgery weight difference in regression analysis ($R=.63$; $R^2=.40$; $F=0.943$, $p=.76$). However, post-operative evaluation showed that 7 of 16 determinants were associated with weight loss: bulimia ($r = -.45$, $p < .001$; Questionnaire clinical Eatings Disorder, QCED), binge eating disorder ($r = -.46$, $p < .001$; QCED), quality of life ($r = .29$, $p < .01$; QLS), salutogenic eating cognitions total scale ($r = .38$, $p < .01$; Questionnaire for salutogenic Eating Cognitions, QSEC), and the three sub-scales of *flexible steering of nutrition intake* ($r = .35$, $p < .01$), *Salutogenic sports attitudes* ($r = .30$, $p < .01$) and *hedonic eating* ($r = .35$, $p < .01$).

To test the hypothesis, a two-factorial ANOVA over all scales was performed (time: pre-operatively vs. 18 to 24 months post-operatively; groups: GB vs. GBP). Furthermore, differences between the two operative methods were examined through an independent sample t-Test.

Results

As shown in Table 4, BMI was greatly reduced following surgery. Variables influencing weight loss and quality of life such as *binge eating* and *bulimia*, *addiction to* o*vereating*, *nutritional preferences for snacks*, and *fatty food* decreased in size. Salutogenic eating habits such as *adherence to recommendations, flexible steering of nutrition intake*, *intrinsic and extrinsic exercise motivation*, and *salutogenic* s*ports attitude* improved 18 to 24 months post-operatively. No differences were found in the subscales *restraint eating*, *h*e*donic* e*ating*, or the pre-clinical eating disorders of *preoccupation with weight and shape* and *preference for healthy nutrition*.

Table 4. Change in cognitive variables related to food intake and exercise behavior pre-operatively and 18 to 24 months post-operatively

		Main Effect Time			Time x Surgical Intervention			Surgical Intervention				Post: GB vs. GBP T-test	
	Subscale	**F**	**p**	**η2**	**F**	**p**	**η2**	**F**	**p**	**η2**	**df**	**t**	**p**
QPEC	Restraint eating	.75	n.s.	.06	0.60	n.s.	.01	1.87	n.s.	.01	117	1.17	n.s.
	Disinhibition	131.87	**<.001**	.56	12.26	**< .01**	.07	0.80	n.s.	.001	117	2.24	**<.05**
	Emotional eating	74.94	**<.001**	.42	7.30	**< .01**	.06	1.49	n.s.	.001	116	.81	n.s.
QSEC	Flexible steering	146.84	**<.001**	.59	23.56	**<.001**	.10	1.81	n.s.	.003	116	4.16	**<.001**
	Hedonic eating	.55	n.s.	.005	2.35	n.s.	.02	.88	n.s.	.008	116	.81	n.s.
	Adherence to recommendations	44.02	**<.001**	.29	2.06	n.s.	.01	.20	n.s.	.000	116	.25	n.s.
QATO	Addiction to overeating	153.11	**<.001**	.59	30.37	**<.001**	.22	1.24	n.s.	.001	116	2.60	**<.01**
QPED	Weight shape preoccupied	4.36	n.s.	.04	2.36	n.s.	.02	1.31	n.s.	.01	109	1.60	n.s.
QCED	Bulimia	2.83	n.s.	.02	32.96	**<.001**	.39	9.07	**<.05**	.15	106	5.34	**<.001**
	Binge eating disorder	1.38	n.s.	.01	26.42	**<.001**	.30	3.67	n.s.	.03	106	5.13	**<.001**
QEM	Exercise motivation	35.17	**<.001**	.26	.05	n.s.	.001	.07	n.s.	.001	116	.70	n.s.
SPN	Snacks	59.70	**<.001**	.37	5.59	**<.05**	.05	.67	n.s.	.001	115	2.27	**<.05**
	Healthy food	.09	n.s.	.000	.28	n.s.	.000	.32	n.s.	.000	115	.27	n.s.
	Fatty food	47.29	**<.001**	.32	11.73	**<.01**	.10	.04	n.s.	.000	115	1.90	**<.05**
QSEC	Salutogenic sports attitude	94.56	**<.001**	.48	3.36	n.s.	.03	.25	n.s.	.000	116	.80	n.s.
QLS	Quality of life	87.00	**<.001**	.46	1.78	n.s.	.01	2.27	n.s.	.02	120	2.22	**<.05**
BMI		43.80	**<.001**	.29	.01	n.s.	.000	2.15	n.s.	.01	120	3.11	**<.01**

QPEC: Questionnaire on pathogenic eating cognitions; QSEC: Questionnaire on salutogenic eating cognitions; QATO Questionnaire on addiction to overeating; QPED: Questionnaire on preclinical disorders; QCED: Questionnaire on clinical disorders; QEM: Questionnaire on exercise motivation; SNP: Scale of nutrition preferences; QSEC: Questionnaire on salutogenic sports motivation; QLS: Quality of life scale; F: Two way mixed ANOVA (time x surgical intervention); t: T-Test for independent samples.

Ten variables changed significantly whichever the type of intervention. Interestingly, there was an

interaction of post-operative change of direction of many scores with the chosen bariatric method. GBP patients had higher pre-surgical BMIs, and the values of six variables in this group changed positively post-operatively. Despite a poorer pre-operative situation, the post-operative GBP group had better results in comparison to the GB group ($p<.05$; $\eta 2 \geq .07$ to $\leq .39$). (Table 4, Time x Surgical Intervention).

Table 5 displays results for both groups in seven areas that showed large changes: *disinhibition, emotional eating, restraint eating, adherence to recommendations, craving for and addiction to overeating, preference for healthy food,* and *quality of life.* The post-operative results did not differ from those of a representative study of 4400 Austrian and German adults and 6600 children/youths of normal weight. However, no changes occurred with respect to *restraint eating, eating pleasure*, and *preference for healthy food*; however, these variables differed only slightly from those of the normal weight reference group. Pre-clinical eating disorders (*preoccupation with shape/weight, preference for diets, full or partial discontentment with own body*) were twice as high among those who remained obese or overweight compared to normal weight people (Table 5).

Table 5. Pre-operative and post-operative descriptive values for morbidly obese patients compared to normal weight patients

	Subscale	**Mean & SD Normal weight**	**Mean & SD** (BMI>40) **Patients t1**	**Mean & SD** (BMI 30-35) **Patients t2**	**T**	**df**	**Sig.**
QPEC	Restraint eating[2]	25.41 ±8.61	28.02 ±9.86	**28.49** ±9.81	0.43	117	**n.s.**
	Disinhibition[2]	**23.74** ±6.37	35.73±10.03	23.18 ± 8.07	12.14	117	< 0.01
	Emotional eating[2]	**13.6**7 ±6.62	22.18 ±9.23	14.29 ±6.95	9.34	116	< 0.01
QSEC	Flexible steering[3]	**43.1**5 ±7.09	31.57 ±7.56	44.31 ±7.54	13.43	116	< 0.01
	Enjoyment of eating[3]	26.03 ±3.00	23.47 ±4.04	**23.73** ±3.48	0.65	116	**n.s**
	Adherence to recommen-dations[3]	**23.22** ±3.84	20.19 ±4.55	23.57 ±3.88	7.81	116	< 0.01
QATO	Addiction to Overeating[2]	**20.10** ±7.92	34.09±10.75	19.77 ±8.66	13.43	116	< 0.01
QPED	Weight/Shape[2]	10.10 ±3.46	20.54 ±4.39	**19.01** ±5.17	1.72	109	**n.s.**
QCED	Bulimia[2] BED[2]	3.49 ±6.27 **2.14** ±3	8.20 ±8.06 7.44 ±6.55	**4.03** ±10.69 2.16 ±5.21	3.01 6.12	106 106	< 0.05 < 0.01
QEM	Exercise motivation[3]	**27.21** ±6.60	25.24 ±7.29	29.29 ±7.29	6.78	116	< 0.01
SPN	Snacks[2]	**103.42**±19.67	98.65±17.44	82.24 ±18.88	9.24	115	< 0.01
	Healthy food[3]	54.82 ±8.22	54.13 ± 7.88	54.44 ±6.94	0.50	115	**n.s.**

	Fatty food[2]	**30.40** ±6.52	32.92 ±5.68	28.48 ±6.11	8.27	115	< 0.01
QSEC	Salutogenic sports attitude[3]	26.89 ±6.24	17.33 ±6.14	24.00 ±7.17	10.68	116	< 0.01
QLS	Quality of life[3]	**38.64** ±5.12	29.21 ±9.83	38.91 ±8.88	10.28	115	<.0.01
BMI		**19-25**	**45.52 ±5.89**	**33.54 ±6.69**	18.06	118	<0.01

QPEC: Questionnaire on pathogenic eating cognitions; QSEC: Questionnaire on salutogenic eating cognitions; QATO: Questionnaire on addiction to overeating; QPED: Questionnaire on preclinical disorders; QCED: Questionnaire on clinical disorders; QEM: Questionnaire on exercise motivation; SNP: Scale of nutrition preferences; QSEC: Questionnaire on salutogenic sports attitude; QLS: Quality of life scale; [2] = the lower the better; [3] = the higher the better.

Discussion

Our finding that gastric bypass, whose effect is attributed to a greater impact on neuro-hormones (65), led to fundamental changes in *addiction to overeating* scores based on neurocognitive events (66), is consistent with the findings that particular biological factors appear to be the reason for differences in outcomes between gastric banding and bypass (67).

The increased aversion to *fatty foods*, high calorific *sweets*, and salty *snacks* is consistent with normal food aversions induced by bypass. Because of decreased weight and the physical effect "to carry less weight," we observed a significant increase in *exercise motivation* and *quality of life*.

Hormonal and physical alterations causing more favorable satiety and hunger processes may also have led to a change to increase *recommended salutogenetic behavior.* This change is shown in the significantly increased values of *adherence to recommendation*, *flexible handling of food* and *salutogenic attitudes toward physical activity and sports.*

Those who had undergone bypass had lower post-operative *eating disorders* scores, whereas scores rose for those with gastric banding. This finding is consistent with previously published results (68-71) and reports from support groups.

However, some eating behavior steering variables remained unchanged. In total, *cognitive control* remains unimpaired, but it was significantly higher among those with gastric banding, which generally requires more control and restriction by patients compared to those not undergoing this procedure. *Eating pleasure*, *bulimia, binge eating disorder*, *preoccupation with weight and shape,* and *preference for healthy food* remained unchanged as well. One may thus suggest the existence of a general characteristic that is consistent across body size (12): the view that "thin" is the most beautiful and the desire for being thin is strong. This ideal leads to post-surgical dissatisfaction even after an average weight loss of ten BMI points, as patients' average final BMI is obese (30 to 35 kg/m²) or overweight (27 to 30 kg/m²). In the case of gastric banding, great cognitive control is necessary, especially with respect to selecting portion sizes. Such control is neuro-cognitively processed as thought suppression. This attempt at thought

suppression paradoxically leads to thought fixation. For example, thoughts such as "remember **not to** empty your plate," or "don't eat chocolate or sweets…you will feel ill afterwards" enhances saliva production and results in increased consumption of suppressed food and increased likelihood of binge eating, which may be followed by induced vomiting (72, 73). Unfortunately, gastric band recipients are at risk of developing post-operative eating disorders and require a certain amount of cognitive control that ultimately reduces eating enjoyment

Informed decision making and interdisciplinary follow-up

Although many refer to "compliance" after adolescent bariatric surgery (74, 75), responsibility for success remains largely in the hands of the interdisciplinary personnel and caregivers. It is challenging for an adolescent to cope with his/her desperate desire for an attractive body and think rationally about the future. Even among normally developing adolescents, the ability to evaluate the full consequences of their decisions is questionable, as supported by adolescents' issues surrounding piercing and tattoos, which they often as adults deeply regret. Since the 1990s, socio-psychological research has shown that "informed decision making" is the most efficient method for complex decision-making processes (76, 77). It is especially important for decisions about bariatric surgery, which, except for gastric banding, are hardly or not reversible at all.

It is crucial to develop a universal catalog of opportunities, easements and requirements for each bariatric treatment and inform patients of risks and benefits for each of these areas. Ideally this discussion would occur via the "dual concern" approach that has demonstrated effectiveness for chronic diseases such as obesity. The method focuses on the extent to which one is concerned with satisfying the needs and interests of the other party and satisfying one's own needs and interests as well (78). Interdisciplinary experts should communicate in such a way that patients receive sufficient information to make informed decisions. In this way, patients, parents or legal guardians, teachers and others can share responsibility and ease the burden to the professional team, while satisfying both groups (79).

It should be made explicit that the goals of "being healthy" and "getting a more attractive body" post-operatively are more likely to be achieved through patient collaboration with expert teams or advisors. Adolescents, in particular, can be reached via the media, despite a current lack of electronic health app development for decision-making processes and post-operative therapy.

A special emphasis should be placed on acceptance of physical characteristics at odds with prevailing social ideals of beauty. Moreover, education and promotion of salutogenic pleasure of eating, flexible adherence to nutrition, and following physical activity recommendations should be stressed. Techniques for buying, preparing and storing smaller healthy meal portions are generally unknown among adolescents and their parents (80). Although there is a remarkably positive change in attitude toward physical activity and sports motivation following surgery (62), patients' cardio-pulmonary fitness should be monitored as well, as it is a predictor of obesity.

A comparison study showed that a two-year follow-up program was superior to a minimal post-bariatric follow-up program (81) for adolescents (82). The longer duration is suggested because there is currently very little data regarding post-operative health issues in adolescents, including deficiency symptoms (40).

For instance, Beck et al. (83) have found evidence for fluctuations in weight loss and severity of eating disorders after two years. Awareness should be heightened for the often ignored post-bariatric surgery grazing behavior, especially because it may be confused with healthful eating behavior instructions that call for mindful food choices frequently consumed in small amounts throughout the day. Grazing can be "viewed as an unhealthy eating pattern when it is perceived as unplanned, mindless, continuous food consumption" (84). "Picking and nibbling" behavior and post-bariatric surgery anorexia subtypes (85) may also occur.

The ideal type of follow-up therapy remains unknown. A meta-analysis comparing psychotherapeutic intervention versus support groups showed no differences; however, both were more effective than bariatric surgery alone (83).

Recommended interventions often fail due to sociodemographic circumstances. To maximize treatment results, a minimum educational level and privileged social class are generally required (9). Although the number of obese immigrant children has been growing rapidly (86), personnel tend to lack cultural knowledge about foreign eating habits (87,88).

To systematically address the challenges presented herein, our group (65) developed the follow-up scheme presented in Illustration 1 in reference to decision-making heuristics for conservative treatment (89). The scheme includes interdisciplinary follow-up therapy that considers patients' financial resources, social status, and ethnicity. Diabetes trainings, which have been tested for decades, served as the template (90) in conjunction with consideration for parent and school involvement as well as family conflict (91). The approach follows a 10-year tradition of applied digital media such as *Adolescent Cyber-surfing for Health*. Not only do pre-surgical and post-surgical advisors require special training, but social workers, psychotherapists, coaches, mediators and peers are also involved. Support groups and clubs should be asked to participate as well.

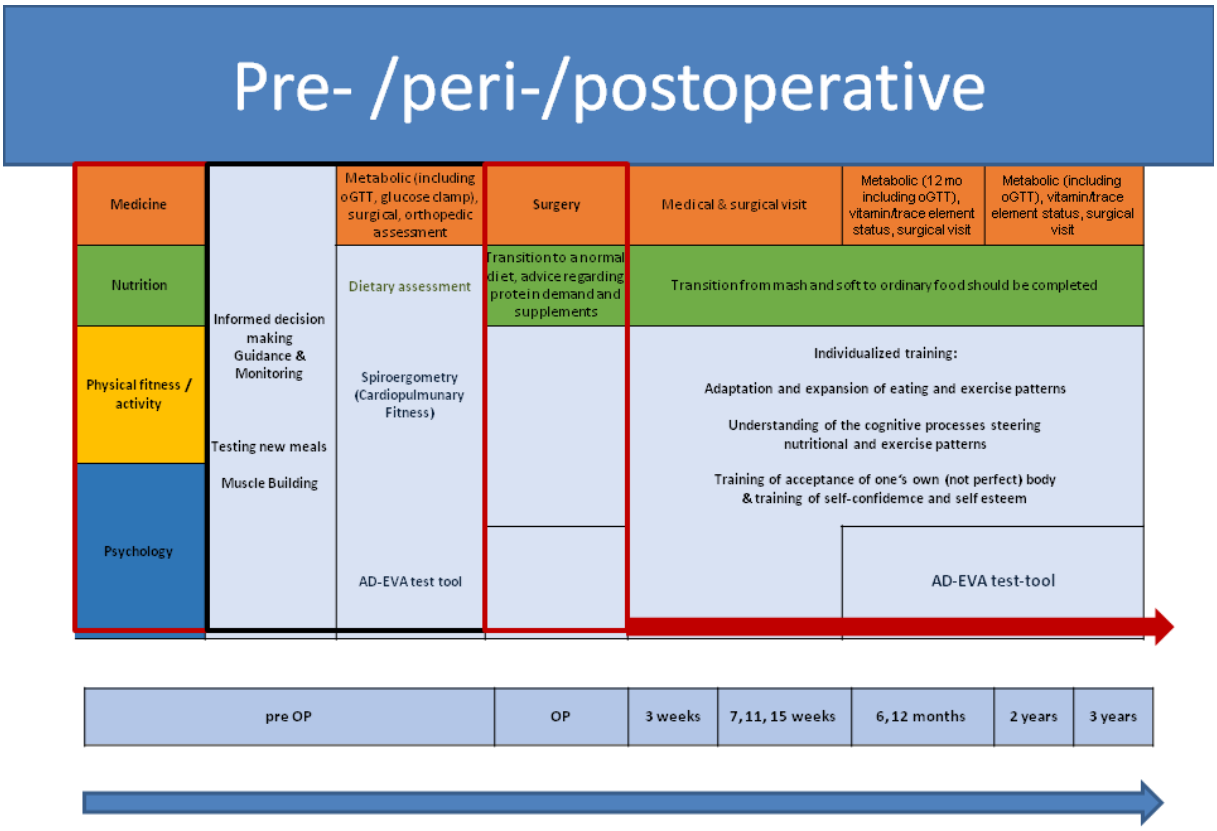

Figure 1. Pre-operative, peri-operative, and postoperative assessment and intervention

Post-surgical therapy requires clinics with state–of-the-art equipment (92, 93) and a well-developed network of institutions including child protective services, social security offices, sport clubs, and psychologists and psychotherapists trained in treating patients with obesity (94-96). In this way, an adolescent who undergoes surgery has the best chance to become "healthy obese" (7) after weight loss.

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~ About the Authors ~

Elisabeth Ardelt-Gattinger

Elisabeth Ardelt-Gattinger, Dr. phil., Univ. Doz. is a retired associate Professor of Psychology at the University of Salzburg and a Psychotherapist. She started her career in Salzburg, researching and teaching in Social, Organizational and Clinical Psychology.

Founding and working in a psychosomatic ward of an Austrian hospital, she worked closely with obese patients and became aware of the massive discriminations they faced. After a research period at the Centre for the Morbidly Obese in Fort Lauderdale she focused her scientific research on this topic.

Based on structured interviewing and testing of around 10.000 people and the analysis of psychological assessments prior to bariatric interventions Elisabeth Ardelt-Gattinger and an interdisciplinary team developed and validated a specific Testsystem for Obesity and other illnesses linked to a unhealthy lifestyle (AD-EVA).

She has been carrying out a lot of obesity prevention projects and she still works as a researcher and lecturer now. She is a member of the Deutsche Gesellschaft für Psychologie (German Society of Psychologie), the Deutsche Adipositas Gesellschaft (DAG) (German Obesity Society) as well as being a founding member of the Obesety Academy Austria (OAA).

Erich Gattinger

Erich Gattinger, Dr.phil, is a university lecturer at the University of Salzburg and at the University of Salzburg Business School. He is also a practicing Clinical and Health Psychologist, Psychotherapist (trained in client centered Psychotherapy, behavioral therapy, systematic family therapy) and Supervisor (Systemic Supervision).

After a managerial position in a non-profit organization, he has been self-employed since 1990 as an adviser, consultant of organizations, coach, supervisor and is a founding member of the Obesity Academy Austria.

Erich Gattinger organized therapy and prevention projects for obese people.

As the founder of MAPS (Mensch Arbeit Psychologie: Institute for Social Analysis and Organizational Development) the focus of his work is on evaluating the outcome and process of prevention and health projects and supervising social non profit organizations.

Susanne Ring-Dimitriou

Susanne Ring-Dimitriou, Dr.sportwiss., is associate professor at the Department of Sport Science and Kinesiology at the University of Salzburg. She started her career in Salzburg, followed by a PhD. study at The German Sport University Cologne (Univ.-Prof. A. Mader and Prof. K. Wilke, Sports Medicine and Science of Exercise Training, 1990-1997). After research cooperation at the Department of Nutrition and Biochemistry at the Aristoteles University Thessaloniki (Univ.-Prof. V. Mougios) she devoted her career to Exercise, Physical Fitness and Health targeting untrained healthy adults and children with metabolic and cardiovascular risks. Currently SALTO, Salzburg together against obesity, a childhood obesity prevention program in Kindergarten is run by her (2014-2018). She is a member of the European College of Sport Science, the Deutsche Vereinigung für Sportwissenschaft (dvs), the Deutsche Adipositas Gesellschaft (DAG), the Österreichische Sportwissenschaftliche Gesellschaft (ÖSG, President 2010-2012) and she is a board member of the Obesity Academy Austria (OAA). In 2009, she finished her Habilitation (Title: Physical Fitness and Metabolic Syndrome) at the University of Salzburg in the field of "Sport Science: Exercise and Health (venia docendi)", where she still works as a researcher and lecturer.

Daniel Weghuber

Daniel Weghuber, MD, is an alumni of Vienna Medical School. He is Associate Professor of Pediatrics at Paracelsus Medical School (PMU) in Salzburg, Austria. Clinically, he works as a consultant at the Department of Pediatrics, heading the Division of Pediatric Gastroenterology, Hepatology and Nutrition and the Obesity Research Unit at PMU, focusing on metabolic comorbidities including glucose and fat metabolism (in particular disturbed insulin sensitivity and secretion) and phenotypes of preclinical atherosclerosis. Other areas of interest include orthopedic and psychological comorbidities, interdisciplinary diagnostics, mitochondrial genetics, and lifestyle and pharmacological treatment of childhood obesity. He currently is Vicepresident of the European Childhood Obesity Group.

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