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Effects of bridging programs before metabolic and bariatric surgery on physical and mental well-being

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List of Abbreviations

AOM	Anti-obesity medications
ARDS	Acute respiratory distress syndrome
ASMBS	American Society for Metabolic and Bariatric Surgery
BMI	Body mass index
BED	Binge eating disorder
BWL	Body weight loss
CBT	Cognitive behavioral therapy
CG	Control group
CI	Confidence interval
EWL	Excess weight loss
FFH	Fisher-Freeman-Halton test
Fig.	Figure
GAD-7	Generalized Anxiety Disorder 7-item questionnaire
GERD	Gastroesophageal reflux disease
GIP	Glucose-dependent insulinotropic peptide
GLP-1	Glucagon-like peptide 1
IFSO	International Federation for the Surgery of Obesity and Metabolic Disorders
IG	Intervention group
IQR	Interquartile range
ITT	Intention to treat
Kg	Kilogram
M	Meter
Max.	Maximum
MBS	Metabolic and bariatric surgery
MCID	Minimal clinically important differences
MD	Mean difference
Min.	Minimum

N	Number
NAFLD	Non-alcoholic fatty liver disease
N.s.	Not significant
OECD	Organization for Economic Co-operation and Development
PHQ-9	Patient Health Questionnaire-9
PICOS	Population, Intervention, Comparison, Outcomes and Study
PP	Per-protocol
PPP	Purchasing power parity
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PSQ20	Perceived Stress Questionnaire 20
RCT	Randomized controlled trials
RoB	Risk of bias
SD	Standard deviation
Sec. mod. School	Secondary modern school
Sec. techn. School	Secondary technical school
SF-12	Short Form 12 Health Survey
TWL	Total weight loss
T0	Baseline
T1	Postintervention / preoperative
T2	Postoperative
UKT	Universitätsklinikum Tübingen
USA	United States of America
USD	United States Dollar
VIADUKT	Verhaltensintervention bei Adipositas am Uniklinikum Tübingen
VLCD	Very low-calorie diet
WHO	World Health Organization
X^2	Chi-square test

1. Introduction

1.1. Definition, prevalence, and diagnosis of obesity

Obesity is a chronic disease characterized by an excessive accumulation of body fat, which can adversely affect health and increases the risk of developing various obesity-related diseases such as type 2 diabetes, cardiovascular diseases, fatty liver disease, cancer and osteoarthrosis (WHO 2023). The Body Mass Index (BMI) is commonly used to assess obesity. It is a surrogate parameter calculated by dividing body weight (in kilograms) by height (in meters squared). A BMI between 18.5 and 24.9 kg/m² is considered normal weight, while a BMI of 25 kg/m² or more is classified as overweight. Obesity is defined as a BMI of 30 kg/m² or more and is further categorized into three classes: Class I obesity includes a BMI of 30-34.9 kg/m², Class II ranges from 35-39.9 kg/m², and a BMI over 40 kg/m² as Class III obesity (Deutsche Gesellschaft für Allgemein- und Viszeralchirurgie 2018).

Although BMI correlates with obesity, it cannot differentiate between fat and other body tissues, such as muscle, which can lead to misinterpretations since a higher BMI may result from either increased muscle mass or excess fat. Consequently, BMI should not be used as a sole diagnostic tool, as it measures body size rather than overall health. To address this limitation, waist circumference is often considered alongside BMI, as it serves a better indicator of visceral fat mass, which is strongly associated with increased health risks due to its role in promoting inflammation and obesity-related diseases (WHO Europe 2022).

The prevalence of obesity has increased dramatically worldwide in recent decades, more than doubling between 1990 and 2022. In 2022, 43% of adults aged 18 and older were classified as overweight, while 16% were living with obesity (WHO 2022, Phelps *et al.* 2024). According to the WHO Report for Europe 2022, nearly 25% of adults in Europe are obese (WHO Europe 2022). In Germany 19.0% of adults were classified as obese in 2019/2020, with obesity prevalence increasing compared to 2012, particularly among middle-aged adults (Schienkiewitz *et al.* 2022). The World Obesity Atlas 2024 estimates that the combined prevalence of overweight and obesity will rise from 42% of adults in

2020 to over 54% by 2035 (World Obesity Federation 2024). Due to its high prevalence, obesity is often regarded as a global health crisis of pandemic proportions (WHO Europe 2022).

Overweight and obesity are not only significant health issues for individuals but also place a substantial economic burden on society. Direct costs include medical expenses associated with the treatment of obesity and its related comorbidities, while indirect costs arise from factors such as reduced quality of life, absenteeism, decreased productivity due to illness-related disability, and premature retirement. In Europe, approximately 8.4% of healthcare budgets are allocated to manage obesity and its related conditions, amounting to an estimated USD 311 billion per year in purchasing power parity (PPP). Individuals with overweight require more frequent healthcare services, undergo more surgeries, and require twice as many prescriptions compared to those with a healthy weight. On average, in OECD countries, overweight and obesity are projected to account for 70% of treatment costs for diabetes, 23% of treatment costs for cardiovascular diseases, and 9% for cancer treatments (OECD, Adeyemi *et al.* 2022).

1.2. Pathophysiology and Consequences of Obesity

Obesity is caused by a variety of underlying factors including environmental, biological, genetic, epigenetic, and social elements. A significant contributor is the obesogenic environment associated with modern lifestyle, characterized by increased energy intake due to the widespread availability and consumption of high-calorie foods, combined with decreased energy expenditure resulting from sedentary work environments, urbanization, and motorized transportation (WHO Europe 2022, Blüher 2024). This imbalance fosters a chronic positive energy balance, leading to progressive weight gain.

The identification of hormones and neural structures in the central nervous system involved in weight regulation has revealed a complex neuroendocrine system that significantly influences weight loss. This system serves as a barrier to significant weight loss by actively counteracting a negative energy balance and undernutrition. While this adaptive mechanism was evolutionarily beneficial for survival, it has become a disadvantage in modern environments with easy access to high-caloric foods (Müller *et al.* 2022).

The hereditability of obesity is estimated to be 40-70%, based on twin, family, and adoptions studies. However, genetic predisposition to obesity is typically polygenic, meaning that most individuals develop obesity only when genetic susceptibility is combined with environmental and lifestyle factors (Hinney *et al.* 2010). Research has identified several genetic variants associated with obesity-related traits, including BMI, food preference, energy regulation, lipid metabolism, and neurologic pathways involved in feeding. In rare cases, which affect only about 1% of individuals, monogenic mutations can lead to obesity, often affecting the leptin signaling pathway, which typically suppresses appetite. Obesity hereditability is also influenced by epigenetics, which involves reversible DNA alterations that can affect gene expression without changing the nucleotide sequence. However, it remains unclear whether these epigenetic changes are predominantly a consequence rather than a cause of obesity (Busebee *et al.* 2023).

In about 5% of cases, secondary obesity occurs due to underlying medical conditions, such as endocrine disorders (e.g., Cushing's disease) or neurological conditions (e.g., brain tumors) (Herold 2019).

In addition, psychological and behavioral factors contribute to the development of obesity, including habitual eating patterns, meal timing, snacking behaviors, levels of physical activity, sleep deprivation and mental health issues such as depression (Deutsche Adipositas-Gesellschaft 2014, WHO Europe 2022).

Physiological consequences of obesity

Excessive accumulation of adipose tissue in individuals with obesity leads to metabolic, inflammatory, immune, and mechanical alterations that contribute to the onset and progression of obesity-related diseases (Busebee *et al.* 2023). Obesity affects nearly every organ system in the body and increases the risk of cardiovascular diseases (e.g. atherosclerosis, hypertension, and coronary heart disease) and endocrine disorders, particularly type 2 diabetes mellitus (WHO

Europe 2022, Busebee *et al.* 2023). Additionally, obesity heightens the likelihood of gastrointestinal issues, including gastroesophageal reflux disease (GERD), liver diseases like non-alcoholic fatty liver disease (NAFLD), and gallbladder conditions, including cholelithiasis. Pulmonary diseases such as obstructive sleep apnea and musculoskeletal problems, including reduced exercise capacity are also prevalent. Although overweight is generally considered less problematic than obesity regarding metabolic comorbidities, it can still lead to joint and musculoskeletal issues over the long term (King *et al.* 2013). Moreover, obesity has been identified as a risk factor for 13 types of cancer. Overall, obesity and related diseases have been associated with increased mortality, with life expectancy potentially reduced by up to 20 years.

In addition, individuals with obesity are more vulnerable to infectious diseases. For example, obesity has emerged as a significant risk factor during the COVID-19 pandemic, influencing both susceptibility to and severity of the disease. Individuals with obesity are at a higher risk of contracting COVID-19 due to chronic low-grade inflammation, which can impair the immune system's ability to respond effectively to infections (Alwarawrah *et al.* 2018, Yan *et al.* 2021). Furthermore, obesity is linked to severe clinical outcomes in individuals infected with COVID-19, including higher rates of hospitalization, intensive care unit admission, and mortality (Busebee *et al.* 2023), and leads to complications like acute respiratory distress syndrome (ARDS) (Yan *et al.* 2021). Moreover, obesity frequently coexists with other chronic conditions, such as type 2 diabetes, hypertension, and cardiovascular disease, all of which are known to increase the risk of severe complications from COVID-19 (Dalamaga *et al.* 2021).

Psychological consequences of obesity

The psychological and social burden associated with obesity is substantial, with evidence suggesting a bidirectional relationship between obesity and mental health: While obesity can lead to psychological distress, pre-existing mental health conditions can contribute to the development and maintenance of obesity. However, research suggests that higher body weight is more often a cause of psychological distress rather than a consequence of it (Avila *et al.* 2015, Steptoe *et al.* 2023).

Obesity is associated with psychiatric illness, with estimates suggesting that between 20-60% of individuals with obesity, particularly those with extreme obesity, suffer from a psychiatric illness with prevalence rates described as 31.5% for depression and up to 24% for anxiety (Cohen *et al.* 2023, Noria *et al.* 2023, Sarwer *et al.* 2020). Among candidates for metabolic and bariatric surgery (MBS) 40% report current symptoms of depression at the time of surgery and 50% report a lifetime history of depression. Anxiety disorders, especially in social situations are particularly prevalent among these individuals (Sarwer *et al.* 2020, Sarwer *et al.* 2016, Steptoe *et al.* 2023).

Additionally, individuals with obesity have a higher risk of developing eating disorders, such as binge eating disorder (BED) and emotional eating, compared to those with normal weight (up to 50% for eating disorders). Approximately 10% of MBS candidates report a history of substance abuse or alcoholism, a rate higher than observed in the general population (Avila *et al.* 2015, Sarwer *et al.* 2016).

The underlying reasons for the negative mental impact of obesity have not been clearly identified. Individuals with obesity often face social stigma and discrimination in workplaces, healthcare settings, and society and the constant societal pressure to conform to weight and appearance standards can cause significant psychological stress (Sarwer *et al.* 2016, Steptoe *et al.* 2023). This stigma can become internalized, with individuals attributing their weight to personal failings, thereby worsening body image issues, mental health and self-esteem (Sarwer *et al.* 2016).

In addition, physical limitations caused by obesity, such as limited mobility, joint pain, or breathing difficulties, make it difficult to participate in physically demanding activities and therefore reducing social interaction and participation in community activities such as sports or outings (Ball *et al.* 2000, Görres *et al.* 2024, Rejeski *et al.* 2010, Sutkowska *et al.* 2024). For example, individuals with obesity may struggle to navigate stairs or walk long distances, leading to avoidance of social gatherings, public places, or events that require physical exertion (Eves 2020, Forhan *et al.* 2013). These psychological challenges, combined with the direct physical impacts of obesity, often result in a decline in quality of life (Sarwer *et al.* 2016).

1.3. Treatment of obesity

The goal of obesity treatment is to achieve and maintain weight loss, reduce obesity-related risk factors and comorbidities, and improve quality of life. Evidence suggests that even a sustained long-term weight loss of 5-10% of initial body weight results in significant health benefits, including improvements in obesity-related diseases (WHO Europe 2022, Durrer-Schutz *et al.* 2019, Gadde *et al.* 2018, Jensen *et al.* 2014). Indications for obesity treatment include a BMI >30 kg/m^2, the presence of obesity-related comorbidities, and subjective distress. Treatment approaches can be categorized into conservative methods, pharmacologic interventions, and surgical options (Deutsche Adipositas-Gesellschaft 2014, Herold 2019).

1.3.1. Conservative Methods

Conservative therapy, also known as basic therapy, focuses on gradual weight reduction and stabilization through sustained lifestyle modifications. This multimodal approach includes dietary and behavioral adjustments and physical activity components, often delivered in structured in-person group sessions (Deutsche Adipositas-Gesellschaft 2014). Dietary counseling emphasizes a lifelong shift toward a high-fiber and low-calorie diet, as strict and one-sided diets have only short-term success and often lead to the yo-yo effect, resulting in weight regain in the long term, usually exceeding the initial weight (Deutsche Adipositas-Gesellschaft 2014, Contreras *et al.* 2019). A key aspect of weight stabilization is increasing physical activity, achieved through both daily exercise and endurance sports, which promotes a negative energy balance. Strength training enhances energy expenditure by building muscle mass (Deutsche Adipositas-Gesellschaft 2014, Herold 2019, Lopez *et al.* 2022). Behavioral therapy addresses habits and attitudes contributing to obesity, using techniques like self-monitoring, stimulus control, cognitive restructuring, and relapse prevention. The German guideline recommends integrating all three components into a comprehensive treatment strategy and emphasizes that treatment goals should be realistic and tailored to the individuals needs and resources (Deutsche Adipositas-Gesellschaft 2014). This guideline, along with international ones, suggests a realistic target of 5%–10% weight loss within one year when using conservative methods (Jensen *et al.* 2014, Yumuk *et al.* 2015). However, research has shown that moderate lifestyle interventions alone typically achieve weight losses of only 4%–6%, suggesting that greater weight reductions remain challenging without additional interventions (Bauer *et al.* 2020).

1.3.2. Pharmacological Methods

In addition to conservative therapy, anti-obesity medications (AOMs) are increasingly utilized to support weight loss (Deutsche Adipositas-Gesellschaft 2014, Durrer-Schutz *et al.* 2019). Glucagon-like peptide-1 *(*GLP-1) receptor agonists, originally developed for type 2 diabetes treatment, have shown significant effects on weight loss and are now approved for weight management. These medications belong to the class of incretin mimetics, which mimic gut hormones such as GLP-1 and glucose-dependent insulinotropic peptide (GIP) (Wang *et al.* 2023). Incretins are secreted by enteroendocrine cells in the intestine in response to food intake. They stimulate pancreatic insulin secretion in a glucose-dependent manner, act on the brain to decrease body weight by inhibiting food intake, increase feelings of satiety, reduce hunger, and slow gastric emptying, resulting in overall weight loss (Gutgesell *et al.* 2024). These medications are approved for obesity treatment on individuals with a BMI ≥ 27 kg/m² with comorbidities or BMI ≥30 kg/m² without comorbidities (Deutsche Adipositas-Gesellschaft 2023). Average weight loss of approximately 8-15% can be achieved after one year, depending on the specific medication used (Iqbal *et al.* 2022, Pi-Sunyer *et al.* 2015, Wilding *et al.* 2021). However, several challenges remain because these medications are expensive, often require out-of-pocket payment, and weight regain is common after discontinuation (Deutsche

Adipositas-Gesellschaft 2023). Additionally, gastrointestinal side effects are frequent reported (Sher *et al.* 2024, Vosburg *et al.* 2022, Wadden *et al.* 2023).

While incretin mono-agonists like semaglutide (2.4 mg, one-weekly injection) resulted in body weight reduction up to 14.9%, combining two different incretins such as the GLP-1/GIP dual agonist tirzepatide (15 mg, once weekly injection) has led to even greater average weight loss of 22.5% after 72 weeks in a phase 3 trial. Further advancements are being made with tri-agonists, which act on GLP-1, GIP, and glucagon receptors simultaneously (Gutgesell *et al.* 2024). A recent trial examining retatrutide, a tri-agonist, showed promising results with mean weight loss ranging from 8.7% to 24.2% depending on the dose, as compared to 2.1% in the placebo group after 48 weeks. Additionally, 72% of participants with prediabetes returned to normoglycemia with retatrutide, compared to 22% in the placebo group. The safety and tolerability of retatrutide are comparable to those of GLP-1 receptor mono-agonists and GLP-1/GIP dual agonists (Jastreboff *et al.* 2023). However, its efficacy in weight loss is significantly greater, potentially bridging the gap between pharmacotherapy and MBS by achieving results closer to those of surgery. Looking ahead, the continued development and combination of anti-obesity drugs may allow future obesity treatments to achieve effects comparable to the dimensions of metabolic and bariatric surgery, see in the following section.

1.3.3. Metabolic and bariatric surgery

Metabolic and bariatric surgery: Procedures

Metabolic and bariatric surgery encompasses surgical procedures designed to treat obesity by modifying the digestive system to promote weight loss. Techniques such as gastric banding and sleeve gastrectomy reduce stomach volume, thereby limiting food intake and calorie consumption. Sleeve gastrectomy additionally removes the portion of the stomach responsible for producing ghrelin, a hormone that stimulates hunger, resulting in decreased appetite and hunger levels. Other procedures, such as Roux-en-Y gastric bypass and biliopancreatic diversion (with or without duodenal switch) not only reduce stomach volume, but also modify the food pathway in the small intestine, delaying digestion and limiting nutrient absorption (American Society for Metabolic & Bariatric Surgery 2021, Deutsche Gesellschaft für Allgemein- und Viszeralchirurgie 2018).

The exact mechanisms underlying MBS are not yet fully understood, but are thought to be multifactorial, involving changes in gastrointestinal hormone secretion, bile acid metabolism, microbiome composition, systemic inflammation, energy balance, taste perception, and cognitive regulation of appetite. Each procedure has its specific advantages and disadvantages, and the choice of surgery is based on the patient's BMI, comorbidities, age, and individual needs. Sleeve gastrectomy and Roux-en-Y gastric bypass are the most commonly performed procedures and have the highest level of evidence (Deutsche Gesellschaft für Allgemein- und Viszeralchirurgie 2018). MBS is typically performed laparoscopically, which is associated with faster recovery, reduced postoperative pain, and lower complication rates (American Society for Metabolic & Bariatric Surgery 2021). Perioperative mortality rates for these procedures are low, ranging from 0.03 to 0.2%, indicating a small risk of death directly related to surgery (Eisenberg *et al.* 2023, Ghiassi *et al.* 2020).

Metabolic and bariatric surgery: Indication and Contraindications

MBS is considered a treatment option for severe obesity when conservative methods have been unsuccessful. According to the 2018 guidelines of the German Society for General and Visceral Surgery, surgical intervention is indicated for patients with a BMI of 40 kg/m² or higher without comorbidities, or a BMI of 35 kg/m² or higher with obesity-related comorbidities, provided that conservative treatments have been unsuccessful (Deutsche Gesellschaft für Allgemein- und Viszeralchirurgie 2018). Failure of conservative treatment is defined as not achieving 15-20% weight loss within two years, despite at least six months of lifestyle modifications, or if achieved weight loss did not adequately improve obesity-related comorbidities. The guideline notes that BMI thresholds for MBS are historically based and suggests that potential benefits exist even at lower BMI levels. Metabolic improvements, particularly in type 2 diabetes, occur independently of BMI, challenging BMI-based criteria for MBS (Deutsche Gesellschaft für Allgemein- und Viszeralchirurgie 2018). The 2022 guidelines from the American Society for Metabolic and Bariatric Surgery (ASMBS) and International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO) guidelines have already lowered BMI thresholds for MBS, now recommending surgery for individuals with a BMI >35 kg/m^2 regardless of comorbidities and BMI between 30–34.9 kg/m^2, if weight loss is not achieved with conservative methods. These recommendations reflect the evidence that non-surgical treatment options are not effective in achieving permanent weight loss in patients with class II obesity or higher, and even in class I obesity, success with conservative methods is not guaranteed while MBS is a safe and effective method for achieving long-term weight loss (Eisenberg *et al.* 2023). Despite its efficacy, MBS is contraindicated in certain conditions, including mental illnesses such as bulimia nervosa, consumptive diseases such as cancer, and pregnancy (Deutsche Gesellschaft für Allgemein- und Viszeralchirurgie 2018).

Metabolic and bariatric surgery: Weight loss and improvement of comorbidities

MBS provides superior long-term weight loss outcomes compared to conservative methods, with individuals achieving an average excess weight loss (EWL) of approximately 60% (Eisenberg *et al.* 2023). A recent systematic review reported that after 20 years, patients experienced a weight loss of approximately 30.1 kg, corresponding to an EWL of 48.9%, and a total weight loss (TWL) of 22.2% (O'Brien *et al.* 2019). Moreover, MBS demonstrates superiority over conservative methods in improving obesity-related comorbidities, particularly metabolic diseases (Eisenberg *et al.* 2023, Fouse *et al.* 2016). A meta-analysis described remission rates of 92% for type 2 diabetes, 75% for hypertension, 76% for dyslipidemia and 58% for cardiovascular disease (Chang *et al.* 2014). Furthermore, the risk of developing cancer is reduced by 11-50%, depending on cancer type. Additionally, studies have shown significant benefits in terms of mortality: Ten years after MBS, mortality rates are reported to be 30.7% lower and life expectancy is extended by an average of 6.1 years compared to those who did not undergo MBS (Eisenberg et al. 2023, Fouse et al. 2016).

Metabolic and bariatric surgery: Mental health outcomes

Weight loss following MBS is associated with significant improvements in psychosocial well-being and quality of life (Colquitt *et al.* 2014, Hachem *et al.* 2016, Kalarchian and Marcus 2019, Sarwer *et al.* 2020, Sarwer *et al.* 2016). However, in some individuals, depression may persist or even develop postoperatively, and studies indicate an increased risk of suicide in MBS patients (MüllerHase *et al.* 2019). Research suggests that psychological distress may re-emerge in the postoperative course, particularly in patients who struggle with weight loss maintenance.

Psychological and behavioral factors such as non-adherence to dietary and exercise recommendations and eating disorders such as uncontrolled eating have been identified as risk factors for suboptimal postoperative weight loss or even weight gain (Cohen *et al.* 2023, Noria *et al.* 2023). Mental health disorders have been associated with reduced postoperative weight loss, with some evidence suggesting that mood disorders have a greater impact when they occur after surgery. However, studies have not shown that preoperative mental health is a reliable predictor of postoperative weight loss (Dawes *et al.* 2016, MüllerNett *et al.* 2019, Paul *et al.* 2021). Psychosocial factors, including various forms of eating disorders, significantly affect mental quality of life. Preoperative depression and anxiety have been linked to poorer postoperative mental quality of life, influencing overall treatment outcomes (Järvholm *et al.* 2020, KalarchianKing *et al.* 2019). David et al. emphasized that improving psychosocial outcomes is as crucial as achieving weight loss, as better psychosocial functioning reduces psychological distress, enhances well-being, and may indirectly optimize postoperative weight outcomes as a secondary benefit. Despite the identification of mental health issues and eating behavior as risk factors, they have received little attention in preoperative preparation (David et al. 2020, Kim et al. 2016).

Metabolic and bariatric surgery: Preoperative Preparation

Guidelines recommend a comprehensive preoperative evaluation for MBS candidates, including medical history, physical examination, laboratory testing and a surgical information session to determine the patient's suitability for the procedure, particularly from a surgeon's perspective (Deutsche Adipositas-Gesellschaft 2014, Deutsche Gesellschaft für Allgemein- und Viszeralchirurgie 2018, Mechanick *et al.* 2020, O'Kane *et al.* 2020, Yumuk *et al.* 2015). A two-week protein diet is advised immediately before MBS to reduce liver volume and improve metabolic conditions, thereby minimizing surgical risks (Deutsche Gesellschaft für Allgemein- und Viszeralchirurgie 2018, Carter *et al.* 2021).

In Germany, patients are usually required to attempt conservative weight loss methods before qualifying for MBS, though these programs are not specifically designed to prepare patients for surgery (Deutsche Gesellschaft für Allgemein- und Viszeralchirurgie 2018, Auf der Maur *et al.* 2022). Internationally, insurance companies often mandate pre-surgery weight loss or supervised diet attempts ranging from 3 to 18 months. The rationale behind these preoperative requirements is to assess a patient's eligibility and motivation as preoperative weight loss has been associated with better postoperative weight loss outcomes (Alami *et al.* 2007, Gade *et al.* 2015, Hjelmesæth *et al.* 2019, Kushner *et al.* 2021, Liu 2016, Marshall *et al.* 2020, Stewart *et al.* 2016, Watanabe *et al.* 2017). However, reports from the ASMBS and IFSO state that research data does not support the hypothesis that preoperative weight loss programs significantly improve perioperative complications and postoperative weight loss outcomes. Consequently these requirements have been criticized as "arbitrary, potentially harmful and unethical" as they may lead to delays in necessary treatment, worsening of obesity-related conditions, and higher dropout rates from MBS (Brethauer 2011, Kim *et al.* 2016). Tewksbury et al. also noted that the role of insurance companies in implementing weight loss requirements has complicated the assessment of the true clinical value of preoperative interventions (Tewksbury *et al.* 2017).

As an alternative to weight loss requirements and interventions, preoperative lifestyle and education programs have been developed to promote long-term lifestyle changes. These programs educate patients about obesity, surgery, associated risks, and necessary lifestyle modifications regarding behavior, diet, and physical activity (David *et al.* 2020, Kim *et al.* 2016, Lodewijks *et al.* 2022, Tewksbury *et al.* 2017).

We hypothesize that these preoperative interventions can offer additional benefits beyond weight loss, such as enhancing patients' understanding of the surgical procedure, improving adherence to postoperative guidelines, and fostering behavioral changes essential for long-term success. By effectively utilizing the preparation phase, patients can benefit from participation, thereby increasing the long-term success of MBS. To support this approach, a preoperative education program was developed at the University Hospital Tübingen. This program is designed to prepare and inform individuals with obesity about the MBS procedure, bridge the waiting period before surgery, and use this time in a beneficial way. Additionally, it provides a structured opportunity for individuals who need to fulfill conservative methods before gaining access to MBS.

1.4. VIADUKT II: An Example of a Preoperative Education Program

<u>Overview of the VIADUKT programs</u>

At the University Hospital in Tübingen, Germany, the VIADUKT programs (acronym for “Verhaltensintervention bei Adipositas am Uniklinikum Tübingen” corresponding to “Behavioral Intervention for Obesity at the University Hospital Tübingen”) provide specialized care for patients with obesity. These programs are structured into four different courses, each designed for specific patient populations and goals:

VIADUKT I is a conservative weight loss program, VIADUKT II is an educational program to prepare for MBS, VIADUKT III is a postoperative support program for individuals in the first year after MBS, and VIADUKT IV is for individuals who do not achieve weight loss after surgery. The following section describes VIADUKT II in detail:

VIADUKT II

VIADUKT II is a lifestyle and educational program specifically designed for patients with obesity, primarily class 3 obesity and offered at Tübingen University Hospital since 2014. The program educates and prepares individuals for MBS and the postoperative period. At the same time, the program aims to stabilize patients physically and psychologically and motivate them to adopt a healthy lifestyle. However, VIADUKT II is not designed for weight loss.

During the program duration of three months, participants attend four theoretical and three practical sessions. Theoretical sessions include preoperative and postoperative nutrition, stress behavior, and exercise theory.

Program costs were covered by health insurance for patients with 100% attendance. Less than full participation was considered a dropout. Missed sessions could be rescheduled easily due to the limited number of sessions. Patients were recruited either through the multidisciplinary "Adiposity Platform," a collaboration between psychosomatic medicine, nutritional and sports medicine, endocrinology and visceral surgery or through a brochure campaign at general practitioners in the Tübingen area.

Online Delivery via videoconferencing of VIADUKT II

Due to the COVID-19 pandemic, the original in-person sessions of VIADUKT II were transitioned to an online format via videoconferencing in spring 2020, without changing the program content. Research on online interventions prior to MBS is limited, as reviews often include interventions at various time points with inconsistencies in study designs and delivery modes (e.g., comparing apps with structured online programs) (Coldebella *et al.* 2018, Messiah *et al.* 2020). However, remote interventions for conservative weight loss and postoperative MBS patients have demonstrated effectiveness in improving weight loss outcomes (Johnson *et al.* 2019, Mangieri *et al.* 2019). Comparing both delivery modes offers a valuable opportunity to gain further insights into the efficacy of videoconferencing for preoperative programs.

1.5. Research Questions

The aim of this thesis was to contribute to the understanding of the effects of preoperative educational and lifestyle programs on mental health, patient satisfaction, and weight loss while also comparing in-person delivery with online implementation via videoconferencing. Therefore, this thesis addressed the following three questions:

I) What is the impact of preoperative lifestyle and educational interventions before MBS on weight-related outcomes before and after MBS?

II) How do preoperative lifestyle and educational programs affect mental health and patient satisfaction?

III) Is online delivery via videoconferencing of preoperative lifestyle and educational programs equivalent to in-person intervention?

The impact of preoperative lifestyle and educational programs on postoperative weight loss was examined through a systematic review and meta-analysis (Publication 1). Then, the VIADUKT II program was analyzed in terms of its effects on weight loss, psychological benefits, patient satisfaction, and different delivery modes, in an original study (Publication 2). The methods of publication 2 are presented in an abbreviated form in the publication, the full methodological details are available online as Supplementary Material 1, which is also included in this thesis.

The following two publications are included in this thesis:

I. Effects of Lifestyle and Educational Bridging Programs before Bariatric Surgery on Postoperative Weight Loss (publication 1 by Lau et al. 2023, section 2.1)

II. Psychological Benefits of a Preoperative Educational Bridging Program for Bariatric Surgery: Does Face-to-Face versus Videoconference-based delivery make a difference? (publication 2 by Lau et al. 2024, section 2.2)

In the following results section, each publication is briefly introduced to provide an overview of the topic. The introductions are followed by the full text of each paper.

2. Results

2.1. Publication 1: Effects of Lifestyle and Educational Bridging Programs before Bariatric Surgery on Postoperative Weight Loss: A Systematic Review and Meta-Analysis (published in: Obesity Facts. 2023;16(1):1-10, doi: 10.1159/000526945)

Authors: Teresa Lau, Jessica Cook, Rami Archid, Andreas Stengel, Stephan Zipfel, Isabelle Mack

The first contribution is a systematic review/meta-analysis analyzing long-term benefits of preoperative lifestyle interventions on weight outcomes from pre-intervention to one year after MBS (Lau *et al.* 2023).

Preoperative programs aim at multimodal lifestyle changes. Data remains inconclusive because studies investigating these interventions included both pre- and postoperative interventions, making it difficult to isolate the effects of pre-operative programs alone. Given that weight loss is a key outcome that can influence psychological improvements in individuals with obesity, it is important to first assess the efficacy of preoperative interventions.

A systematic literature search was performed using PICOS criteria, and five randomized controlled trials (RCTs) were included in the analysis examining the reduction in BMI in patients with obesity who underwent >1 month of preoperative lifestyle intervention compared to a control group receiving standard care. BMI reduction was measured post-intervention and one-year post-surgery.

The analysis revealed that preoperative lifestyle interventions were more effective at reducing BMI before MBS. However, one year after MBS, no significant difference in weight loss was observed between the intervention group and usual care. The data did not support the hypothesis that the amount of weight loss prior to MBS influenced weight loss outcomes one year after surgery (T2).

Preoperative lifestyle programs are more effective at reducing body weight before MBS, but this is not sustained one year after MBS. The influence of preoperative BMI reduction on postoperative weight remains unclear. As a result, it is currently unclear whether, and under what circumstances, participation in a preoperative lifestyle intervention is beneficial for long-term postoperative outcomes.

Systematic Review

Obesity Facts

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Effects of Lifestyle and Educational Bridging Programs before Bariatric Surgery on Postoperative Weight Loss: A Systematic Review and Meta-Analysis

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Keywords

Bariatric surgery · Preoperative lifestyle intervention · Bridging · Body weight loss · Behavioral interventions

Abstract

Objective: To fulfill the requirements for bariatric surgery, patients often need to participate in mandatory preoperative lifestyle interventions. Currently, the efficacy of multimonth preoperative lifestyle intervention programs on body mass index (BMI) reduction from the start of the program (T0) through the immediate preoperative time point (T1) to 1 year post-surgery (T2) and how the amount of preoperative BMI reduction affects postoperative outcome (T1 to T2) is unclear. The aim of this meta-analysis was to analyze the effects of preoperative lifestyle interventions on BMI 1 year post-surgery. ***Method:*** A systematic literature search was conducted according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses criteria. Randomized controlled trials that implemented preoperative lifestyle interventions lasting 1–8 months before bariatric surgery were included. The BMI of the intervention group was compared with that of a control group before participation in the preoperative lifestyle interventions (T0), after completion of the program before surgery (T1), and 1 year post-surgery (T2). Finally, the impact of successful BMI reduction at T1 on BMI at T2 was analyzed. ***Results:*** $N = 345$ patients derived from 4 studies undergoing preoperative lifestyle interventions reduced their BMI at T1 by 1.5 units compared to the control group (95% CI: −2.73, −0.28). One year post-surgery, both groups had lost comparable BMI points. The influence of reduced BMI at T1 on weight status at T2 is unclear due to the lack of available studies. Other endpoints and subgroup analyses were rarely examined. ***Conclusions:*** Preoperative lifestyle interventions reduce BMI before bariatric surgery more effectively than usual care. These differences are not detectable 1 year post-surgery. Although a short-term energy reduction period before surgery is clearly important to minimize surgery risks, it is currently unclear whether, and if so, under what circumstances, participation in a preoperative lifestyle intervention is beneficial.

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Introduction

Current treatment options for obesity are, on the one hand, conservative weight management methods focusing on reduced energy intake, improved eating behavior, and increased physical activity. Realistic weight loss goals range between 4 and 6% of the initial body weight [1, 2]. On the other hand, there is the possibility of bariatric surgery, which is more effective in reducing body weight, reducing comorbidities, and enhancing quality of life than nonsurgical approaches [3–5]. Through bariatric surgery procedures, total body weight loss (BWL) of 21–22% can be achieved over the long term which corresponds to a 47–48% loss in excess body weight [6]. Other references indicate a total BWL of about 30% [7, 8]. Because the operation risk is low, bariatric surgery is a safe option for reducing body weight, especially when conservative methods have been exhausted [4, 9, 10].

However, there is still an ongoing debate about the ideal treatment of patients before surgery. It is recommended especially by bariatric surgeons to follow a 2-week very low-calorie diet (VLCD) before surgery to minimize risk of surgical complications by losing weight immediately before surgery and therefore reducing liver mass and abdominal fat [11]. In addition, there are also preoperative programs, so-called lifestyle interventions that last for several months, incorporating multiple aspects to different extents: eating behavior, physical activity, behavior change, education about obesity, and information about bariatric surgery. These programs aim to promote healthy long-term lifestyle changes to support bariatric surgery outcomes. Thus, their focus is not only weight loss. However, the question remains whether such programs impact body weight-related outcomes and/or psychological well-being post-surgery, especially since preoperative lifestyle programs are often mandatory before bariatric surgery [12–15].

Four systematic reviews have investigated postoperative differences in weight-related outcomes between an intervention group (IG) that participated in a preoperative lifestyle intervention versus a control group (CG) that underwent usual care [16–19]. Cassie et al. [16] found no differences between the IG and the CG on postoperative weight-related outcomes. Liu [17] reported that in 5 of 8 studies, the IG tended to have a greater weight loss than CG at postoperative endpoints. Stewart et al. included both preoperative and postoperative interventions and concluded that both interventions were able to optimize the post-surgery weight loss. However, the postoperative period appeared to be more favorable for implementation of lifestyle interventions [19]. Marshall et al. [18] found that the IG lost more weight post-surgery through interventions both before and after surgery but also favored the postoperative timing for delivering the program. It is important to note that this analysis included short-term intervention programs with 2-week duration.

None of the reviews examined how the amount of preoperative weight loss achieved through the programs affected postoperative weight loss. Consequently, the impact of multi-month preoperative lifestyle intervention programs on body mass index (BMI) change from the start of the program (T0) to the immediate preoperative time point (T1) and to 1 year post-surgery (T2) and how the success of pre-surgery BWL affects the postoperative outcomes (T1 on T2) are currently unclear. The overall aim of this meta-analysis was to provide a comprehensive overview of the effect of >1-month preoperative lifestyle interventions on BWL 1 year post-bariatric surgery. The following three review questions were examined to evaluate whether or not preoperative interventions in comparison to usual care before bariatric surgery are beneficial.

- Do lifestyle interventions delivered preoperatively reduce BMI before a bariatric surgery procedure?
- Do individuals completing a lifestyle intervention program preoperatively decrease their BMI greater post-surgery in comparison to individuals undergoing usual care?
- Are individuals who have successfully reduced their BMI preoperatively through a lifestyle intervention more successful at decreasing the BMI postoperatively than individuals with no success?

Methods

This review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines [20]. The review protocol was registered at the International Prospective Register of Systematic Reviews (PROSPERO; CRD42021200524).

Literature Information Sources and Search Strategy

A systematic literature search was conducted on 21 May 2020 and updated on 28 April 2021, in the databases PubMed, Web of Science, and the Cochrane Library. The full search strategy is documented in the online supplementary Material 1 (for all online suppl. material, see www.karger.com/doi/10.1159/000526945) and was based on the five PICOS dimensions, i.e., participants (P), interventions (I), comparators (C), outcome (O), and study design (S) to identify all relevant articles [21]. Studies were included if they had the following characteristics.

Participants

Patients with obesity of both sexes and all ethnicities aged ≥18 years and an indication for bariatric surgery. To avoid selection bias of specific groups, studies conducted exclusively in specific patient groups (e.g., type 2 diabetes, metabolic syndrome) were excluded.

Interventions

Preoperative lifestyle interventions for a mean period of 1–8 months before bariatric surgery consisting of (a) dietary interventions including meal replacement and VLCD (very low-calorie diet), (b) behavioral/psychological interventions, and (c) educational programs preparing for changes post-bariatric surgery combined with or without physical activity were included. Studies only recommending weight loss without further interventions were excluded. The period of 8 months was chosen because many intervention programs are designed for 6 months but are extended due to vacations, catch-up appointments, illness, and program organization. Studies lasting less than 4 weeks were excluded because they were indistinguishable from the 2-week protein diets immediately before surgery.

Comparators

Studies with CGs that underwent usual care before bariatric surgery.

Outcome

The primary outcome was body weight-related parameters including BWL (in % or kg), BMI, change in BMI, and other weight-related parameters. Data were extracted from text, tables, and graphs. Body weight-related parameters were assessed before (T0) and for review question 1 after completing the preoperative lifestyle intervention before surgery (T1) and for review question 2 after a mean duration of 12–36 months post-surgery (T2). Question 3 examines the effects of preoperative (T1) on postoperative body weight change (T2). Studies with self-reported weight post-bariatric surgery were included since self-reported weight after bariatric surgery is similar to the objectively measured body weight [22].

Study Design

Randomized controlled trials (RCTs) published in peer-reviewed journals in English were included.

Study Selection, Data Collection, and Organization

The search results of the three databases were combined and duplicates were removed. Next, titles and abstracts were screened independently by two authors (TL and JC) to identify appropriate studies, and their eligibility was discussed in cases of disagreement. To provide a structured overview, the studies were categorized into three groups according to our research questions. *Group 1*: Effect of preoperative lifestyle interventions on pre-surgery BMI reduction (T0 to T1); *Group 2*: Effect of preoperative lifestyle interventions on postoperative BMI reduction (T0 to T2); *Group 3:* Impact of successful BMI reduction before surgery on postoperative outcome (T1 to T2).

Data Items and Statistics

The following information was extracted from each included article: year of publication, country of origin, study type, sample characterization (including sample size, sex, age), BMI (T0: baseline BMI, T1: preoperative BMI, and T2: postoperative BMI), information on the bridging interventions (type of intervention, duration, frequency, interval to surgery), operation method, and follow-up length. Characteristics across studies are presented as median (interquartile range), minimum and maximum for sample size, intervention length, age, and sex. The analyses were performed using the software package Review Manager (Review Manager [RevMan] [Computer program], Version 5.4. The Cochrane Collaboration, 2020). BMI data at T1 and T2, corresponding standard deviations, and sample sizes are presented separately for the IG and CG, and the difference is expressed as mean difference and 95% confidence interval and displayed in forest plots. Statistical heterogeneity was examined by visual inspection of forest plots and using the I^2 statistics to quantify inconsistency between the studies. I^2 heterogenity below 40% is considered low. Robustness of the results was tested by repeating the analysis using different statistical models (fixed-effects and random-effects models). In case of missing data, authors were contacted by email. All authors have responded and have provided the most relevant data.

Risk of Bias

A risk of bias assessment was performed for all included studies using the Cochrane risk-of-bias tool RoB 2 for randomized trials [23]. The tool is divided into 5 domains addressing different types of bias: randomization, deviations from the intended interventions, missing outcome data, measurement of the outcome, and selection of the reported result. In each domain, different signaling questions are used to evaluate the risk of bias. With the help of an algorithm, the risks of the individual sections are evaluated, and an overall risk is calculated and expressed as "low" or "high" risk of bias or can be expressed as "some concerns."

Results

Study Selection and Categorization

A total of 1,092 articles were identified through databases and hand search. Five of the articles met the inclusion criteria [24–28]. Figure 1 shows the detailed process of the systematic literature search. One trial (Hjelmesæth et al. [26]) was a follow-up publication of another included paper (Gade et al. [25]). Thus, the data of both papers were summarized and analyzed as one study.

Summary of Study Characteristics

A detailed description of the characteristics of the single trials is given in Table 1. The trials were published between 2012 and 2019. Two studies were conducted in Norway, one took place in Canada and one in the USA. All studies included behavior change interventions. In total, the four trials included 345 participants. The median sample size was 89 (66–109) and ranged between 25 and 143 participants. The duration of the interventions lasted from 6 to 33 weeks with a median length of 18 (9–28)

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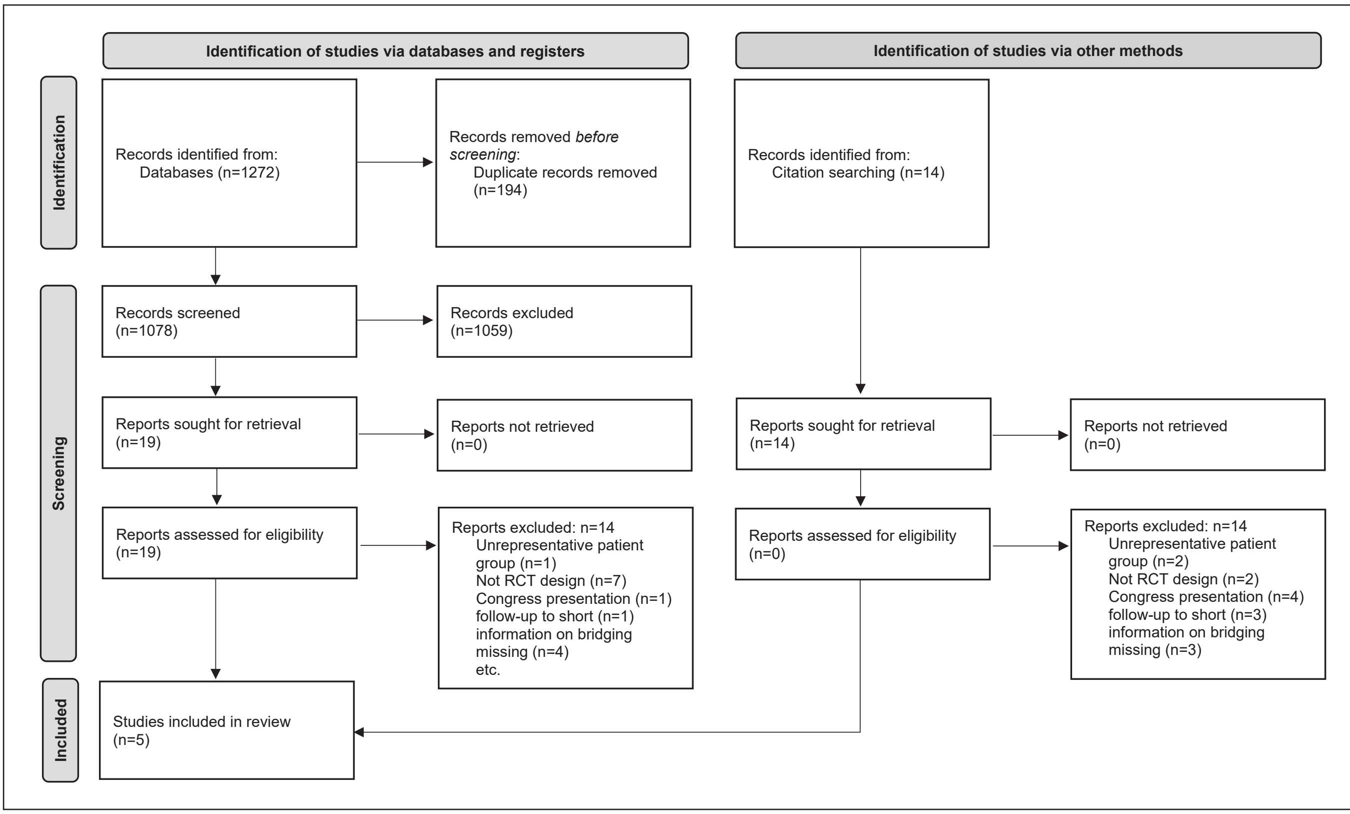

Fig. 1. PRISMA flow diagram. N: number; RCT: randomized controlled trial.

Table 1. Characteristics of studies

First author [ref.] (year)	Country		Sample size and characterization at T0				Intervention type
			N	age, years	women	BMI, kg/m^2	
Baillot et al. [24] (2018)	Canada	IG	13	44.5 (8.8)	84.6%	47.3 (7.3)	Counseling sessions Exercise training sessions (33 weeks)
		CG	12	41.1 (10.3)	75.0%	48.4 (9.2)	
Gade et al. [25] (2015)/ Hjelmesæth et al. [26] (2019)	Norway	IG	42	44.1 (9.8)	64.3%	43.6 (5.1)	Cognitive behavioral therapy (10 weeks)
		CG	38	41.2 (9.6)	73.3%	43.5 (4.7)	
Kalarchian et al. [27] (2016)	USA	IG	71	43.9 (10.3)	90.1%	47.4 (6.2)	Behavioral weight management program (26 weeks)
		CG	72	45.9 (11.6)	90.3%	47.6 (6.5)	
Lier et al. [28] (2012)	Norway	IG	49	43.5 (11.1)	74.0%	45.5 (4.3)	Cognitive behavioral treatment program (6 weeks)
		CG	48	42.4 (9.1)	67.0%	45.1 (5.9)	

Age and BMI are presented as mean and standard deviation. T0: time at baseline; N: number; BMI: body mass index; IG: intervention group; CG: control group; kg: kilogram; m: meter.

Table 2. Risk of bias

Study ID	D1	D2	D3	D4	D5	Overall
Baillot et al. [24], 2018	⊕	⊕	⊕	⊕	⊕	⊕
Gade et al. [25], 2015/ Hjelmesæth et al. [26], 2019	⊕	⊕	⊘	⊕	⊕	⊕
Kalarchian et al. [27], 2016	⊕	⊕	⊘	⊕	⊕	⊕
Lier et al. [28], 2012	⊕	⊕	⊘	⊕	⊕	⊕

D1: randomization process; D2: deviations from the intended interventions; D3: Missing outcome data; D4: measurement of the outcome; D5: selection of the reported result. ⊕: Low risk; ⊘: Some concerns; ⊖: High risk.

weeks (4.5 months). The participants had a median age of 43.6 (42.9–44.5) years (min: 42.9, max: 44.9) and 75% of the participants were women.

Risk of Bias

Table 2 summarizes the risk of bias assessment. The overall risk of bias for the included trials was low.

Bias Arising from the Randomization Process

The randomization and allocation of participants was of low risk of bias in all trials.

Bias due to Deviations from Intended Interventions

For some exposures, such as behavioral interventions including counseling, diet restrictions, and physical activity, it is not possible to entirely blind research staff and participants during the study. However, since no deviations from the study protocols were identified, the performance bias was considered low.

Bias due to Missing Outcome Data

Three of the trials were analyzed per protocol and not per intention-to-treat. The dropout rate of these 3 RCTs was above 20%, with two even exceeding 30%. Consequently, attrition bias was assessed with “some concerns.”

Bias in Measurement of the Outcome

The outcome measurement was of low risk of bias because weight-related parameters like BMI as an outcome are very reliable and objectively measurable.

Bias in Selection of the Reported Result

The adherence to study protocols was of low risk of bias.

Summary of Study Outcome

Group 1: Effect of Pre-Operative Lifestyle Interventions on Pre-Surgery BMI Reduction (T0 to T1)

For the analysis of group 1, three trials were eligible [24–27]. The baseline BMIs were similar between IG and CG in all RCTs. Two studies demonstrated no effect of bridging on preoperative BMI [24, 27]. In contrast, Gade et al. [25]/Hjelmesæth et al. [26] favored the IG for BWL (mean BMI difference −1.36 kg/m^2, 95% CI: − 1.95, −0.77; $p < 0.001$). Figure 2 shows the quantitative analysis of these three RCT studies and is in favor of preoperative lifestyle interventions. Participants who underwent preoperative intervention had 1.44 BMI units less in comparison to the controls (95% CI: −2.01, −0.86). There is no statistical heterogeneity among the studies ($I^2 = 0\%$), and the random-effects and fixed-effect models yielded identical results.

Group 2: Effect of Pre-Operative Lifestyle Interventions on Post-Operative BMI Reduction (T0 to T2)

All four trials were included for analysis [24–28]. None of the studies reported a significant difference in BMI decrease between the IG and CG 1 year post-surgery. In line, the quantitative analysis (shown in Fig. 3) found no superiority of preoperative bridging intervention in comparison to standard care. One year post-surgery, the IG lost mean −0.05 BMI units [95% CI: −1.39, 1.29] compared to the CG. Statistical heterogeneity among the studies was $I^2 = 0\%$, and the random-effects and fixed-effect models displayed identical results.

Group 3: Impact of Successful BMI Reduction before Surgery on the Post-Operative Outcome (T1 to T2)

Kalarchian et al. [27] were the only out of the four RCTs which examined the role of pre-surgery BWL on

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Study or Subgroup	Intervention group Mean	SD	Total	Control group Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Baillot 2018	46.4	7.73	13	48.5	11.66	12	0.5%	-2.10 [-9.92, 5.72]
Gade 2015/Hjelmesæth 2019	42.2	1.21	48	43.6	1.76	50	91.6%	-1.40 [-2.00, -0.80]
Kalarchian 2016	44.6	5.7	71	46.4	6.7	72	7.8%	-1.80 [-3.84, 0.24]
Total (95% CI)			**132**			**134**	**100.0%**	**-1.44 [-2.01, -0.86]**

Heterogeneity: Tau² = 0.00; Chi² = 0.16, df = 2 (P = 0.92); I² = 0%
Test for overall effect: Z = 4.93 (P < 0.00001)

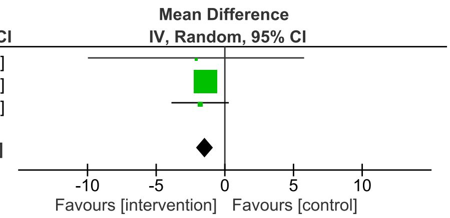

Fig. 2. Quantitative analysis of BMI at T1. BMI: body mass index; T1: time point at T1 (before bariatric surgery); SD: standard deviation; CI: confidence interval; IV: inverse variance.

Study or Subgroup	Intervention group Mean	SD	Total	Control group Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Baillot 2018	30.4	6.07	13	34.9	9.82	12	3.0%	-4.50 [-10.96, 1.96]
Gade 2015/Hjelmesæth 2019	30	3.53	42	29.5	3.19	38	57.8%	0.50 [-0.97, 1.97]
Kalarchian 2016	34.1	6.92	71	33.4	6.55	72	25.7%	0.70 [-1.51, 2.91]
Lier 2012	30.8	7.35	34	31.7	5	30	13.5%	-0.90 [-3.95, 2.15]
Total (95% CI)			**160**			**152**	**100.0%**	**0.21 [-0.91, 1.33]**

Heterogeneity: Tau² = 0.00; Chi² = 2.89, df = 3 (P = 0.41); I² = 0%
Test for overall effect: Z = 0.37 (P = 0.71)

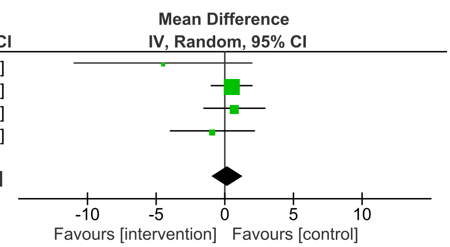

Fig. 3. Quantitative analysis of BMI at T2. BMI: body mass index; T2: 12 months after bariatric surgery; SD: standard deviation; CI: confidence interval; IV: inverse variance.

postoperative BWL outcomes; thus, no quantitative analysis is possible for this group. Participants who lost more than 5% of their initial body weight preoperatively (group ≥5%) and those who lost less than 5% of their initial body weight (group <5%) were distinguished. These two different weight loss groups were compared from 6 months to 24 months post-surgery for their % BWL. Six months after bariatric surgery, the "group ≥5%" lost more than the "group <5%" (25.7% BWL vs. 22.3% BWL, $p < 0.0006$). This significant difference between these groups disappeared after 12 months (28.5% vs. 28.3% weight loss, $p = 0.33$) and 24 months (28.1% vs. 27.8% weight loss, $p = 0.37$) post-surgery, respectively. Besides this RCT by Kalarchian et al. [27], we identified 14 non-RCT studies during our research process covering the topic of the impact of successful BMI reduction before surgery on the postoperative outcome. The findings of these studies are incorporated into the discussion.

Discussion

The aim of this systematic review and meta-analysis was to analyze the long-term benefit in BMI reduction of patients with obesity undergoing >1-month preoperative lifestyle interventions versus usual care before bariatric surgery. Our first review question showed that preoperatively delivered lifestyle interventions reduce BMI before a bariatric procedure better than usual care. The purpose of these preoperative interventions is to prepare for surgery and to provide knowledge for a lifelong healthy lifestyle. The results indicate that participation in such preoperative lifestyle interventions before bariatric surgery led to minor BWL, which contribute to decreased risk during the procedure. However, these intervention programs may have their limitations since Bauer et al. [29] recently showed that having a positive attitude toward bariatric surgery per se hinders an individual's weight loss in a 6-month, multimodal lifestyle intervention. Personal exhaustion toward conservative weight loss programs and a lack of motivation may be underlying factors. Thus, a personalized approach for choosing the appropriate program for weight loss (focus of program, length) before bariatric surgery may achieve the best results. In terms of psychological well-being, the situation is completely unclear. Despite minor weight loss in patients wishing to undergo bariatric surgery in the abovementioned study by Bauer et al. [29], depressive and anxiety symptoms and quality of life had similar improvement in comparison to the patients not wishing to undergo bariatric surgery. Especially for psychologically unstable patients, such lifestyle interventions could help improve compliance post-bariatric surgery, which is known to be critical, e.g., in patients with depression [30]. However, this is speculation at this point since no evidence is available in the literature.

Taking this topic further, the second question examined if individuals completing a lifestyle intervention program preoperatively would decrease their BMI greater post-surgery in comparison to individuals undergoing usual care. Both the IG and CG did not differ in their BMI losses 1 year post-surgery. Bariatric surgery itself is such a strong intervention factor for BWL that it is most likely that other small achievements before surgery are negligible in impacting long-term outcomes when an approximate energy balance is finally achieved post-surgery [31–34]. After surgery, when BWL occurs naturally, if not counteracted due to severe psychological conditions such as depression, the patients themselves experience the full benefit of weight loss, accompanied by an increase in quality of life and a considerable positive impact on their motivation to change their lifestyle [30, 35]. Although it has been suggested that the postoperative timing for lifestyle intervention may be more favorable than the preoperative timing [18, 19], a high-quality randomized, controlled multicenter study showed that a video-based postoperative treatment was not superior to treatment as usual [35]. However, postoperative support is inevitably important for patients with depression and other psychological problems [30, 35].

Finally, the third review question examined whether or not individuals having successfully reduced their BMI preoperatively through the lifestyle intervention were more successful at decreasing the BMI postoperatively in comparison to individuals with no success. Since only one RCT addressed this question, this did not allow for quantitative analysis. No differences in BWL after 12 and 24 months post-surgery between the preoperative weight loss and non-weight loss group were detected.

These results are supported by 14 other non-RCT addressing this issue [36–49]. Some of these studies examined preoperative lifestyle modification programs or short educational trainings [37–44, 47–49], whereas the other three studies only examined the impact of a certain percentage or amount of weight loss before surgery on postoperative weight loss [36, 45, 46]. All studies examined the impact of successful preoperative BWL on BWL 12 months post-surgery, except for one study which performed a follow-up until 6.3 years [45]. The results of 9 out of the 14 studies were in line with the only RCT existing on this topic, showing that the success of pre-surgery BWL did not influence postoperative weight loss [36, 38–40, 42–47, 49]. In contrast, three other studies concluded that patients who either participated in preoperative programs or successfully met the weight loss guidelines preoperatively were more successful in losing weight post-surgery [37, 41, 48].

Since there appears to be no or only minor benefit in undergoing lifestyle intervention programs prior to surgery in terms of body weight reduction, the question arises whether there are other benefits from these interventions for bariatric surgery candidates. As mentioned above, improvement of psychological stability can be expected from such programs independent of attitude toward bariatric surgery, which may be especially important for patients with psychological burden [29, 50].

In this review, three of the included trials examined secondary outcomes in addition to BWL [24–26, 28]. Lier et al. [28] concluded that preoperative interventions lead to better treatment compliance. Additionally, they examined patient's satisfaction with the program. However, their results did not show a relation between satisfaction and compliance with the intervention.

Two studies investigated quality of life and reported no differences between IG and CG 1 year post-surgery [24–26]. Gade et al. [25]/Hjelmasaeth et al. [26] reported a faster improvement of pathological eating patterns and affective symptoms (anxiety and depression symptoms) through pre-surgery lifestyle intervention, but in their follow-up publication at 4 years post-surgery, these improvements were no longer related [26]. These results are not unexpected since initial BWL per se increases quality of life in patients with obesity [51, 52]. In summary, only few studies investigated factors other than BWL. For these, no superiority in the long-term was shown for preoperative lifestyle intervention programs. Nevertheless, it is important to note that no subgroup analyses for vulnerable groups, e.g., with depression, were reported by any of these studies.

This leads to the question to what degree lifestyle intervention and information should be provided preoperatively to (i) educate patients appropriately about the surgery and the consequences and (ii) prepare and initiate an improved lifestyle without unnecessarily lengthening the time to surgery? As pointed out already above, a personalized approach taking into account especially the psychological situation of the patients may be most suitable.

Overall, although not a topic of this review, the short-term VLCD immediately before the operation to lose weight and therefore minimize surgery complications is efficient and has been widely used with success [11, 53]. In addition, patients need a thorough education about the surgery and its consequences to allow them to feel secure and have realistic expectations regarding the amount of weight loss and resolution of comorbidities following surgery [54]. This period should not last too long in order to allow a fast transfer to surgery [55]. Under which circumstances a preoperative lifestyle intervention is advantageous is not clear at the current stage of evidence. However, after bariatric surgery, vulnerable groups, e.g., with depression, need support for compliance and favorable outcomes [35, 56].

This study has several strengths and limitations. Most importantly, this meta-analysis showed minimal heterogeneity among the studies, allowing to conclude that the results of the quantitative analyses are reliable. However, the findings are based on only four RCTs which differed in content and extent of their interventions, and the used I^2 statistics should be treated with caution when a meta-analysis includes only a few studies [57]. Secondary outcomes like psychological well-being were rarely investigated, and no subgroup analysis for vulnerable groups, e.g., with depression, was reported. In this review, only postop periods of 1 year could be considered due to a lack of long-term data exceeding this time period.

Conclusions

Preoperative lifestyle programs are often mandatory before bariatric surgery. However, although preoperative lifestyle interventions reduce body weight before bariatric surgery more effectively than usual care, this difference disappears 1 year post-surgery. Although a short-term energy reduction period before surgery is clearly important to minimize risk, it is currently unclear whether, and if so under what circumstances, participation in a preoperative lifestyle intervention is beneficial.

Key Points

- Preoperative lifestyle interventions reduce BMI before bariatric surgery.
- BMI reduction post-surgery is independent of preoperative lifestyle intervention.
- Influence of pre-surgery BMI reduction on postoperative weight success is unclear.
- Secondary outcomes and psychological well-being are rarely investigated.

Statement of Ethics

An ethics statement is not applicable because this study is based exclusively on published literature.

Conflict of Interest Statement

The authors declare no conflicts of interest.

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Author Contributions

Conceptualization: Isabelle Mack, Teresa Lau, Jessica Cook, and Rami Archid; methodology and validation: Teresa Lau, Jessica Cook, and Isabelle Mack; software and data curation: Teresa Lau and Jessica Cook; formal analysis and visualization: Teresa Lau; supervision: Isabelle Mack; discussion of results and interpretation: Teresa Lau, Jessica Cook, Stephan Zipfel, Rami Archid, Andreas Stengel, and Isabelle Mack; writing – original draft preparation: Teresa Lau and Isabelle Mack; writing – review and editing and approval of the final version: Teresa Lau, Jessica Cook, Stephan Zipfel, Rami Archid, Andreas Stengel, and Isabelle Mack.

Data Availability Statement

All data generated or analyzed during this study are included in this article and its supplementary material files. Further inquiries can be directed to the corresponding author.

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2.2. Publication 2: Psychological Benefits of a Preoperative Educational Bridging Program for Bariatric Surgery: Does Face-to-Face versus Videoconference-based delivery make a difference? (Published in: Obesity Facts. 2024;17(6): 553-569, doi: 10.1159/000539797)

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The second contribution of this thesis is a research article investigating the effects of an educational program before MBS on patients' mental health and their perspectives (Lau *et al.* 2024). In addition, the effectiveness of delivering the program online via videoconferencing was analyzed.

Preoperative lifestyle and educational interventions may offer benefits beyond weight loss, such as improving patients' understanding of the surgical procedure, enhancing adherence to postoperative guidelines, and promoting behavioral changes essential for long-term success. This study aimed to explore these potential psychological and educational benefits.

The study analyzed changes in psychological parameters, including quality of life, stress, depression, and anxiety disorders, as well as body weight before and after participation in a preoperative lifestyle and educational program. Data was collected using standardized questionnaires and measurements at the beginning and end of the intervention. The study also compared the effectiveness of delivering the program through videoconferencing versus traditional face-to-face sessions.

The findings revealed that short educational programs prior to MBS can significantly improve symptoms of depression, anxiety, and perceived stress. Participants reported high levels of satisfaction and personal benefit from the program. In addition, delivering the program via videoconference achieved similar psychological benefits as traditional face-to-face sessions.

Taken together, the educational program effectively bridged the gap in preoperative preparation while stabilizing participants' mental health. Participants perceived the program as supportive, and online participation via videoconferencing was found to be an equivalent option to face-to-face classes.

Research Article

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Psychological Benefits of a Preoperative Educational Bridging Program for Bariatric Surgery: Does Face-to-Face versus Videoconference-Based Delivery Make a Difference?

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Keywords

Bariatric surgery · Benefits · Bridging · Mental health · Online delivery · Preoperative preparation · Videoconferencing

Abstract

Introduction: Short educational programs prior to metabolic and bariatric surgery (MBS) provide information to prepare patients adequately for surgery and subsequent changes. Our knowledge of the beneficial effects of these programs on stabilizing and improving mental health of patients with obesity awaiting surgery is incomplete. The objective of this study was to assess the effects of a group-based educational program before MBS on three key factors: (i) patients' mental health, (ii) the program's perceived helpfulness from the patients' perspective, and (iii) the effectiveness of delivering the program online via videoconferencing. ***Methods:*** Validated questionnaires for anxiety, depression, stress, and quality of life before and after the program were assessed. Additionally, participants' perspectives of benefits were assessed. Two subgroups, one participating in face-to-face classes, the other participating online via videoconferencing, were compared. ***Results:*** Three hundred five patients with obesity waiting for MBS participated in the program. The dropout rate was 3%. On mean average, symptoms of anxiety (−1.1 units [SD 4.6], $p < 0.001$), depression (−0.9 units [SD 4.6], $p < 0.001$), and stress (−4.6 units [SD 15.6], $p < 0.001$) improved, while physical quality of life (+1.7 units [SD 9.7], $p = 0.016$) and body weight (−0.3 kg [SD 8.7], $p = 0.57$) remained stable. Patients perceived the program as very beneficial. The results were similar between delivery methods (face-to-face vs. videoconferencing). ***Conclusion:*** The educational program proved to be effective in bridging the gap in preoperative preparation

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while also stabilizing participants' mental health. In addition, participants perceived the program as supportive. Online participation via video conferencing can be offered as an equivalent option to face-to-face classes.

Introduction

Obesity and its associated diseases such as type 2 diabetes, hypertension, and cardiovascular diseases are major public health challenges [1–3]. Treatment strategies range from conservative approaches focusing on lifestyle changes to pharmacotherapy and metabolic and bariatric surgery (MBS) [4, 5]. MBS is particularly important in the treatment of severe obesity, as it has been shown to result in significant long-term weight loss and improvement or resolution of weight-related diseases [5, 6]. Because surgery has proven to be safe and effective in the long term, recent recommendations suggest considering MBS for individuals with a BMI of 35 kg/m^2 or higher, regardless of weight-related diseases, and even for those with class I obesity [7].

However, suboptimal weight loss or weight regain after surgery affects up to 2 out of 10 patients [8–10]. The main cause of unsuccessful weight loss appears to be unmodified behavior, mainly related to maladaptive eating patterns and sedentary lifestyle [10]. Mental illness, particularly anxiety disorders and depression, also play a significant role [11, 12] and should be addressed during the preoperative preparation [13–16]. Current preparation is provided through one-time information sessions or educational materials after conservative weight loss attempts have failed [7, 17]. Various guidelines remain vague about preoperative intervention and focus on assessing the patient's eligibility for surgery by evaluating surgical risks instead of giving explicit rules [4, 17–19]. The reason is that it is still unclear under which circumstances participation in a preoperative lifestyle intervention is beneficial. Preoperative lifestyle programs did not result in significant greater weight loss 1 year after surgery and the effect of these programs on participants' well-being and mental health remains unclear [20–22]. Another preparation method is cognitive behavioral therapy (CBT) that has short-term positive effects on psychological well-being, but these effects were not detectable in the long-term after surgery [23–25]. Furthermore, CBT is a complex intervention, and its implementation takes a long time [26]. Moreover, it is not necessary for all patients undergoing MBS [24, 25].

Given these challenges, cost-effective low-barrier interventions, such as short educational programs delivered in group settings providing information about MBS, the time after and a healthy lifestyle appear more suitable and pragmatic to prepare patients adequately for surgery and subsequent changes. Apart from their educational function, it would be interesting to know whether they have an additional positive effect on the psyche of the participants and can stabilize them until surgery. In addition, the current evidence on using digital tools instead of face-to-face meetings for preoperative interventions is limited [27, 28]. Therefore, the aim of this explorative study was to investigate whether a group-based educational preoperative program for MBS (i) can stabilize and improve patient's mental health along with (ii) the program being perceived as supportive preoperative preparation method and (iii) whether online delivery via videoconferencing is equal to face-to-face intervention.

Materials and Methods

Data were analyzed from May 2014 (start of the program) to August 2022. A more detailed description of the methods than given here can be found in online supplementary material 1 (for all online suppl. material, see https://doi.org/10.1159/000539797).

Treatment and Participants

The Viadukt II program is an educational program offered at the University Hospital Tuebingen to adults with obesity, primarily those with class 3 obesity. These patients have (i) undergone conservative therapies according to the guidelines but still need to exhaust conservative methods before qualifying for MBS as the next step in guideline-based therapy or (ii) have a primary indication for surgery, such as severe weight-related diseases that preclude conservative treatment. Further information about participants is presented in online supplementary material 1.

The program aims to bridge the time to MBS by (i) educating and preparing the patients for surgery and the period thereafter as well as to (ii) physically and psychologically stabilize them and motivate for healthy lifestyle changes. The 2-week protein diet prior to MBS to minimize the surgical risk is done separately afterward. The program lasts 3 months and consists of four theoretical sessions and three exercise sessions see Table 1 [29]. Originally, the program was conducted as face-to-face group meetings. Due to the COVID-19 pandemic, the in-person version was transformed into an online intervention via video conferencing platform in spring 2020. The content of the program remained identical. The face-to-face sessions were attended by 12 participants and each session lasted 90 min, while the

Table 1. Overview of educational sessions

1. General eating behavior
Meal rhythm and composition
Dietary recommendations
Portion size
Eating culture
Operation methods and effect on changed food intake
2. Stress and nutrition
Basics on eating motives and stress
Eating behavior analysis
Emotional eating
Coping strategies
Mindfulness and self-care
3. Theory session on exercise
Importance of physical activity
Positive effects of physical activity
Recommendations on duration and intensity
Ways to increase movement in everyday life
Sport: endurance and strength training
Tips for implementation
4. Eating behavior around and after bariatric surgery
Protein phase
Postoperative diet structure
Postoperative complications

videoconference-based sessions had no more than 10 participants and lasted 1 h each.

In case of 100% participation, program costs were covered by health insurance. Less than 100% attendance was classified as dropout. Since the program consisted of only a few sessions, missed sessions could easily be rescheduled.

Outcomes

Baseline data were collected at the start of the intervention (T0) and included socioeconomic characteristics, body weight, body height, and questionnaires assessing anxiety (GAD-7), depression (PHQ-9), perceived stress (PSQ20), and quality of life (SF-12). After the program (T1), but before surgery, the same questionnaires were completed, and weight was measured again. The psychometric questionnaires are described in detail in the online supplementary material 1. Minimal clinically important differences (MCIDs) for the questionnaires were reported when available, and the percentages of participants achieving MCIDs (improvement or worsening) were calculated. The MCID is defined as the smallest change in a clinical outcome measure that is considered meaningful and relevant to patients [30, 31]. In addition, participants completed an evaluation questionnaire at the end of the intervention, also provided in online supplementary material 1.

Body weight was measured in kilograms and height was measured in centimeters by the course instructor, details see online supplementary material 1. In the videoconference subgroup, body weight and height were self-reported. Previous literature shows that self-assessment of body weight is correct even in individuals with obesity [32, 33].

Statistical Analysis

Data are reported as mean (standard deviation, SD), confidence interval (CI) and median with 25th and 75th percentiles (interquartile range). Frequencies are expressed as percentages (%). Statistical tests were performed state to the art. Statistical details, including missing data imputation are provided in supplementary material 1. p values <0.001 were considered statistically significant, while p values between 0.001 and 0.05 were considered as trend. In short, the following three analyses were performed:

1. Testing for differences in psychometrics and body weight between the beginning (T0) and end (T1) of the intervention for the entire study group
2. A subgroup analysis testing for interactions and time effects between the two course formats “face-to-face” versus “videoconference” including a matched subgroup analysis
3. Analyses of the participants’ personal benefits

Results

Data were analyzed for the intention-to-treat, per-protocol (PP), and matched population. Since no significant differences were observed between these approaches, the intention-to-treat analysis is presented in this manuscript. Tables for the total group for PP analysis can be found in online supplementary materials 2 and 3 and for subgroups (PP and matched analyses) in online supplementary materials 4 and 5.

Baseline Characteristics

N = 360 individuals participated in the preoperative educational program between May 2014 and August 2022. Among them, n = 55 did not complete any preprogram questionnaires and were excluded from the analysis. They did not differ significantly from the cohort who completed the questionnaires in terms of age, sex, weight, and BMI both at T0 and T1. Therefore, the total group consisted of n = 305 participants in the following analyses. Most participants had class III obesity, with an average BMI of 48.1 kg/m^2 (SD 5.9) and weight of 135.2 kg (SD 20.4) and a mean age of 41.1 years (SD 12.0). The sample predominantly comprised female subjects (76%). A detailed overview of the baseline characteristics for the total group is presented in Table 2.

Non-Completers

The dropout rate was 2.8% (n = 10 participants). There were no significant differences between completers and dropouts at baseline.

Subgroups

Among the participants, n = 222 patients attended the program face-to-face, and 97.2% completed the intervention (face-to-face subgroup). N = 66 patients received the intervention via videoconference due to the COVID-19

Table 2. Baseline characteristics total group and subgroups (ITT)

	Total group (*N* = 305)	Face-to-face group (*N* = 222)	Videoconference group (*N* = 66)	Statistics for face-to-face versus videoconference, Mann-Whitney U test/ χ^2/FFH
	mean (SD) [95% CI]	mean (SD) [95% CI]	mean (SD) [95% CI]	
Age, years	41.1 (12.0) [39.8–42.5]	41.1 (11.7) [39.5–42.6]	40.6 (12.1) [37.6–43.5]	U = 7,133.000, p = 0.745
Weight, kg	135.2 (20.4) [132.9–137.5]	134.7 (20.4) [132.0–137.4]	137.8 (20.4) [132.8–142.8]	U = 8,127.000, p = 0.177
Weight range: min to max, kg	92.0–200.0	99.0–200.0	92.0–192.0	
BMI, kg/m^2	48.1 (5.9) [47.4–48.8]	47.8 (5.3) [47.1–48.5]	48.8 (5.6) [47.4–50.2]	U = 8,324.500, p = 0.093
BMI range: min to max, kg/m^2	35.4–92.8	37.8–68.3	35.4–60.9	
	N (%)	*N* (%)	*N* (%)	
Obesity class, *n* (%)				
Obesity I°	0 (0)	0 (0)	0 (0)	
Obesity II°	15 (4.9)	9 (4.1)	4 (6.1)	
Obesity III°	290 (95.1)	213 (95.9)	62 (93.9)	
Sex, female	233 (76.4)	170 (76.6)	50 (75.8)	χ^2 (1) = 0.019, p = 0.891
Nationality				
German/foreigner	240/60 (78.7/19.7)	175/44 (78.8/19.8)	51/14 (77.3/21.2)	χ^2 (1) = 0.065, p = 0.799
Smoker	93 (30.5)	74 (33.3)	17 (25.8)	χ^2 (1) = 1.351, p = 0.245
Personal status				
Single	93 (30.5)	62 (27.9)	26 (39.4)	$\chi^{2\ FFH}$ = 4.729, p = 0.339
Married	164 (53.8)	124 (55.9)	31 (47)	
Separated	3 (1)	2 (0.9)	1 (1.5)	
Divorced	30 (9.8)	25 (11.3)	5 (7.6)	
Widowed	8 (2.6)	3 (1.4)	2 (3)	
Others	6 (2)	5 (2.3)	1 (1.5)	
Living situation				
Alone	43 (0.3)	31 (14)	12 (18.2)	$\chi^{2\ FFH}$ = 1.605, p = 0.965
With partner	58 (44.3)	42 (18.9)	12 (18.2)	
Alone with Child(ren)	17 (1.3)	12 (5.4)	4 (6.1)	
Partner and Child(ren)	138 (33.1)	101 (45.5)	29 (43.9)	
With parents	37 (7.5)	27 (12.2)	6 (9.1)	
Others	11 (6.6)	9 (4.1)	2 (3)	
Level of education				
Secondary school	135 (47.7)	109 (53.4)	19 (30.2)	$\chi^{2\ FFH}$ = 12.381, p = 0.011
Polytechnic	4 (1.4)	3 (1.5)	1 (1.6)	
Technical. school	101 (35.7)	65 (31.9)	29 (46)	
High school	23 (8.1)	13 (6.4)	9 (14.3)	
University	20 (7.1)	14 (6.9)	5 (7.9)	
Occupation status				
Employed	107 (35.1)	23 (34.8)	23 (34.8)	χ^2 (1) = 0.016, p = 0.900
Unemployed	193 (63.3)	42 (63.6)	42 (63.6)	

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Table 2 (continued)

Questionnaires	mean (SD) [95% CI]	median [IQR]	mean (SD) [95% CI]	median [IQR]	mean (SD) [95% CI]	median [IQR]	
Anxiety (GAD-7)	7.9 (4.8) [7.3–8.4]	7.0 [4.0–11.0]	7.7 (4.9) [7.0–8.3]	7.0 [4.0–11.0]	8.2 (4.7) [7.0–9.3]	7.0 [4.0–11.3]	U = 7,539.500, *p* = 0.440
Depression (PHQ-9)	9.4 (5.3) [8.8–10.1]	9.0 [5.0–13.0]	9.3 (5.3) [8.5–10.1]	9.0 [5.0–13.0]	9.5 (5.4) [8.2–10.8]	8.5 [5.3–13.0]	U = 5,597.000, *p* = 0.951
Stress experience (PSQ20)							
Overall score	51.2 (18.5) [49.1–53.3]	53.3 [37.9–65.0]	50.5 (18.4) [48.0–53.0]	53.3 [37.1–63.3]	53.1 (19.0) [48.4–57.8]	55.0 [38.3–68.3]	U = 7,552.000, *p* = 0.354
Worries	50.6 (25.2) [47.7–53.5]	53.3 [33.3–66.7]	49.9 (25.5) [46.5–53.3]	53.3 [33.3–66.7]	52.5 (24.9) [46.4–58.7]	60.0 [33.3–73.3]	U = 7,504.500, *p* = 0.397
Tension	54.2 (22.6) [51.6–56.8]	60.0 [40.0–73.3]	52.8 (22.7) [49.7–55.8]	53.3 [33.3–66.7]	57.7 (21.9) [52.3–63.2]	60.0 [36.7–73.3]	U = 7,812.000, *p* = 0.166
Joy	45.6 (21.4) [43.3–48.2]	46.7 [31.7–60.0]	46.1 (20.9) [43.3–48.9]	46.7 [33.3–60.0]	44.4 (23.6) [38.6–50.3]	46.7 [26.7–63.3]	U = 6,939.000, *p* = 0.887
Demands	45.6 (20.6) [43.3–48.0]	43.3 [33.3–60.0]	45.4 (20.4) [42.6–48.1]	43.3 [33.3–60.0]	46.4 (21.4) [41.2–51.7]	40.0 [33.3–60.0]	U = 7,127.500, *p* = 0.851
Quality of life (SF-12)							
Mental component	42.7 (12.6) [41.3–44.1]	42.6 [32.6–54.3]	43.6 (12.5) [41.9–45.2]	43.3 [33.5–54.7]	40.2 (12.8) [37.0–43.3]	38.0 [29.4–51.7]	U = 6,060.000, *p* = 0.050
Physical component	28.6 (10.0) [27.5–29.8]	27.3 [21.6–34.9]	28.8 (10.4) [27.4–30.1]	27.8 [21.4–35.5]	28.0 (9.3) [25.7–30.3]	26.7 [21.1–34.9]	U = 6,976.000, *p* = 0.685

pandemic (videoconference subgroup). *N* = 17 participants attending both formats during the change in delivery method were excluded from the subgroup analysis to clearly distinguish between both course formats. Apart from the trend for the face-to-face subgroup to have a lower level of education ($\chi^{2\ FFH}$ = 12.381, *p* = 0.011), there were no significant differences between the two subgroups in terms of baseline characteristics and questionnaires, a detailed overview is presented in Table 2.

To address possible differences resulting from unequal sample sizes between subgroups, additional analyses were conducted after matching for sex, age, and initial BMI. The baseline characterization of the matched cohorts, namely face-to-face$_{Matched}$ and videoconference$_{Matched}$, is presented in Table 3. There were no significant differences between these subgroups.

Effectiveness of the Intervention

i) Educational Bridging Improves Symptoms of Depression, Anxiety, and Perceived Stress

In the total group, anxiety symptoms significantly improved during the intervention, with a mean reduction of 1.1 units (SD 4.6, *z* = −3.914, *p* < 0.001). Similarly, depression symptoms significantly improved, with a mean reduction of 0.9 units (SD 4.6, *z* = −3.771, *p* < 0.001), see Table 4 and Figure 1. The entire group reduced their overall stress between T0 and T1 by 4.6 (SD 15.6) points (*z* = −4.976, *p* < 0.001). In particular, the subscale "worries" showed an average improvement of −7.9 points (SD 22.7, *z* = −5.761, *p* < 0.001). A mean reduction of 5 points was achieved for the subscale "tension" (*z* = −4.237, *p* < 0.001) and for the subscale "demands" (*z* = −4.944, *p* < 0.001). There were no significant changes on the "joy" subscale.

Regarding quality of life, there was no significant change in the physical component between T0 and T1. In line, there were almost no changes in weight (−0.3 kg, SD 8.7, *z* = −0.561, *p* = 0.575) and BMI (−0.1 units, SD 3.1, *z* = −0.277, *p* = 0.782) during the intervention. However, there was a trend toward improvement in the mental component of quality of life, with a mean increase of 2.3 points (SD 10.8, *z* = 3.022, *p* = 0.003). Figure 2 shows the MCIDs for anxiety, depression, physical, and mental quality of life.

ii) Participants Benefit Personally from the Program

N = 261 (85.6%) participants completed the evaluation questionnaire after the program. The overall level of satisfaction was very high across the various evaluation categories. Participants rated the importance and usefulness of the sessions very high, felt well informed and prepared for MBS. On a Likert scale ranging from 1

Table 3. Baseline characterization of the age-, sex-, and BMI-matched total sample

	Face-to-face $group_{matched}$, $n = 64$	Videoconference $group_{matched}$, $n = 64$	Statistics face-to-face versus videoconference, Mann-Whitney U/χ^2/FFH test
	mean (SD) [95% CI]	mean (SD) [95% CI]	
Age, years	40.3 (12.1) [37.3–43.3]	40.5 (12.1) [37.4–43.5]	U = 2,062.500, $p = 0.935$
Weight, kg	137.6 (20.0) [132.6–142.6]	137.7 (20.3) [132.6–142.8]	U = 2,106.500, $p = 0.780$
Weight range: min to max, kg	108.0–186.0	92.0–192.0	
BMI, kg/m^2	48.7 (5.2) [47.3–50.0]	48.8 (5.6) [47.4–50.2]	U = 2,134.000, $p = 0.682$
BMI range: min to max, kg/m^2	39.3–62.4	35.4–60.9	
	N (%)	*N* (%)	
Obesity class, *n* (%)			
Obesity I	0 (0)	0 (0.0)	χ^2 (1) = 0.000, $p = 1.000$
Obesity II	1 (1.6)	6 (9.4)	
Obesity III	63 (98.4)	58 (90.6)	
Sex, female	49 (76.6)	49 (76.6)	
Nationality			
German/foreigner	51/12 (79.9/18.8)	49/14 (76.6/21.9)	χ^2 (1) = 0.194, $p = 0.660$
Smoker	24 (37.5)	17 (26.6)	χ^2 (1) = 1.758, $p = 0.185$
Personal status			
Single	21 (32.8)	25 (39.1)	$\chi^{2\ FFH}$ = 1.824, $p = 0.931$
Married	33 (51.6)	30 (46.9)	
Separated	1 (1.6)	1 (1.6)	
Divorced	7 (10.9)	5 (7.8)	
Widowed	2 (3.1)	2 (3.1)	
Others	0 (0)	1 (1.6)	
Living situation			
Alone	10 (15.6)	12 (18.8)	$\chi^{2\ FFH}$ = 2.187, $p = 0.914$
With partner	10 (15.6)	11 (17.2)	
Alone with Child(ren)	3 (4.7)	4 (6.3)	
Partner and Child(ren)	27 (42.2)	28 (43.8)	
With parents	11 (17.2)	6 (9.4)	
Others	3 (4.7)	2 (3.2)	
Level of education			
Secondary school	32 (51.6)	19 (31.1)	
Polytechnic	1 (1.6)	1 (1.6)	$\chi^{2\ FFH}$ = 5.859, $p = 0.272$
Technical school	20 (32.3)	29 (47.5)	
High school	5 (8.1)	8 (13.1)	
University	4 (6.5)	4 (6.6)	
Occupation status			
Employed	20 (31.3)	22 (34.4)	χ^2 (1) = 0.193, $p = 0.660$
Unemployed	44 (68.8)	41 (64.1)	

Table 3 (continued)

Questionnaires	mean (SD) [95% CI]	median [IQR]	mean (SD) [95% CI]	median [IQR]	Statistics
Anxiety (GAD-7)	7.7 (4.6) [6.6–8.9]	7.0 [4.3–10.8]	8.2 (4.8) [7.0–9.4]	7.0 [4.0–11.8]	U = 2,142.500, *p* = 0.651
Depression (PHQ-9)	9.5 (4.4) [8.3–10.6]	10.0 [7.0–12.0]	9.6 (5.4) [8.2–11.0]	9.0 [5.0–13.0]	U = 1,641.00, *p* = 0.726
Stress (PSQ20)					
Overall score	50.1 (18.7) [45.4–54.8]	51.7 [40.0–61.3]	53.5 (18.8) [48.8–58.2]	55.0 [40.0–68.3]	U = 2,269.000, *p* = 0.292
Worries	52.2 (26.2) [45.6–58.7]	53.3 [33.3–73.3]	53.1 (24.5) [47.0–59.3]	60.0 [33.3–73.3]	U = 2,112.000, *p* = 0.759
Tension	52.9 (21.1) [47.7–58.2]	53.3 [40.0–66.7]	58.2 (21.7) [52.8–63.7]	60.0 [40.0–73.3]	U = 2326.000, *p* = 0.183
Joy	45.8 (21.6) [40.4–51.2]	40.0 [33.3–58.3]	44.2 (23.7) [38.3–50.1]	43.3 [26.7–65.0]	U = 2,045.500, *p* = 0.990
Demands	41.1 (21.0) [35.9–46.4]	36.7 [26.7–58.3]	46.7 (21.4) [41.3–52.0]	43.3 [33.3–60.0]	U = 2,348.000, *p* = 0.150
Quality of life (SF-12)					
Mental component	43.0 (12.4) [39.9–46.1]	42.4 [32.6–54.2]	40.3 (12.8) [37.1–43.5]	38.5 [29.3–51.9]	U = 1,782.000, *p* = 0.205
Physical component	27.7 (10.3) [25.2–30.3]	27.9 [19.6–34.3]	28.2 (9.3) [25.9–30.5]	26.8 [21.5–35.0]	U = 2,124.500, *p* = 0.715

(strongly disagree) to 5 (strongly agree), no mean value in any of the queried areas fell below 4.0 points. 96% of participants would recommend the program to friends and family. The results are shown in Figure 3 and in the form of a table in the online supplementary material 6. An additional analysis focused on participants with worsening MCIDs. These subgroups also reported high levels of satisfaction with the program, with similar scores to participants who showed improvement or had stable MCIDs. Detailed information on these analyses can be found in the online supplementary material 7.

iii) Face-To-Face and Videoconference-Based Delivered Bridging Achieves Similar Effectiveness

In line with the results of the total group, both the face-to-face and videoconference subgroups showed improvements over time in anxiety, mental quality of life and for perceived stress on the overall stress scale and on the three subscales "worries," "tension," and "demands." Depressive symptoms and physical quality of life remained unchanged from T0 to T1. There were no interaction effects between the two subgroups indicating that the mode of delivery (face-to-face vs. videoconference) did not significantly influence outcomes. Table 5 and Fig. 4 provide a summary of the results for both subgroups. In addition, there were no statistically significant differences between the MCIDs achieved by the two subgroups, supporting the similar effectiveness of the two delivery modes.

Discussion

In this study, a group-based education program before MBS was evaluated for its (i) impact on the participants' mental health; (ii) beneficial effects from the patients' perspective; and (iii) feasibility and efficacy delivered online via videoconferencing versus face-to-face. The results regarding MCIDs were encouraging. Most participants (84% for anxiety, 88% for depression, and 75% for mental quality of life) either maintained or improved their symptoms. This is noteworthy as participants initially exhibited higher levels of psychological distress, consistent with previous research indicating a higher prevalence of mental illness among individuals with severe obesity compared to those with normal weight [34, 35]. Poor mental health has been identified as a predictor of unsuccessful weight loss after surgery [13, 15, 16].

Table 4. Changes of outcomes for the total group (ITT)

	Total group	Statistics for T0 vs. T1
	(n = 305)	Wilcoxon signed-rank test
Anxiety [GAD-7]		
$Mean_{Post}$ (SD) [95% CI]	6.7 (4.2) [6.3–7.3]	$z = -3.914$, $p < 0.001$, $r = 0.227$
ΔMean between T0 and T1 (SD)	−1.1 (4.6)	
$Median_{Post}$ [IQR]	7.0 [4.0–9.0]	
MCID improved, n (%)	75 (24.6)	
MCID did not change, n (%)	180 (59.0)	
MCID worsened, n (%)	43 (14.1)	
Depression [PHQ-9]		
$Mean_{Post}$ (SD) [95% CI]	8.6 (5.0) [7.9–9.1]	$z = -3.771$, $p < 0.001$, $r = 0.236$
ΔMean between T0 and T1 (SD)	−0.9 (4.6)	
$Median_{Post}$ [IQR]	8.0 [5.0–12.0]	
MCID improved, n (%)	67 (26.3)	
MCID did not change, n (%)	157 (61.6)	
MCID worsened, n (%)	31 (12.2)	
Perceived Stress Questionnaire		
a) Overall score		
$Mean_{Post}$ (SD) [95% CI]	46.5 (17.0) [44.6–48.5]	$z = -4.976$, $p < 0.001$, $r = 0.288$
ΔMean between T0 and T1 (SD)	−4.6 (15.6)	
$Median_{Post}$ [IQR]	46.7 [36.7–58.3]	
b) Worries		
$Mean_{Post}$ (SD) [95% CI]	42.6 (23.4) [40.0–45.4]	$z = -5.761$, $p < 0.001$, $r = 0.334$
ΔMean between T0 and T1 (SD)	−7.9 (22.7)	
$Median_{Post}$ [IQR]	40.0 [26.7–60.0]	
c) Tension		
$Mean_{Post}$ (SD) [95% CI]	49.2 (19.6) [47.1–51.6]	$z = -4.237$, $p <0.001$, $r = 0.245$
ΔMean between T0 and T1 (SD)	−4.9 (20.1)	
$Median_{Post}$ [IQR]	46.7 [40.0–60.0]	
d) Joy		
$Mean_{Post}$ (SD) [95% CI]	46.4 (19.2) [44.1–48.5]	$z = 0.473$, $p = 0.636$, $r = 0.027$
ΔMean between T0 and T1 (SD)	+0.5 (19.8)	
$Median_{Post}$ [IQR]	46.7 [33.3–60.0]	
e) Demands		
$Mean_{Post}$ (SD) [95% CI]	40.6 (18.0) [38.4–42.6]	$z = -4.944$, $p < 0.001$, $r = 0.286$
ΔMean between T0 and T1 (SD)	−5.1 (17.7)	
$Median_{Post}$ [IQR]	40 [26.7–53.3]	
Quality of Life [SF-12]		
a) Mental Sum score		
$Mean_{Post}$ (SD) [95% CI]	45.0 (11.2) [43.7–46.3]	$z = 3.022$, $p = 0.003$, $r = 0.174$
ΔMean between T0 and T1 (SD)	+2.3 (10.8)	
$Median_{Post}$ [IQR]	45.9 [36.2–54.7]	
MCID improved, n (%)	136 (44.6)	
MCID did not change, n (%)	66 (21.6)	
MCID worsened, n (%)	101 (33.1)	
b) Physical Sum score		
$Mean_{Post}$ (SD) [95% CI]	30.3 (10.4) [29.1–31.5]	$z = 2.407$, $p = 0.016$, $r = 0.138$
ΔMean between T0 and T1 (SD)	+1.7 (9.7)	
$Median_{Post}$ [IQR]	28.6 [21.8–38.2]	
MCID improved, n (%)	120 (39.3)	
MCID did not change, n (%)	91 (29.8)	
MCID worsened, n (%)	92 (30.2)	

ΔMean between T0 and T1, mean difference from baseline to postintervention; BMI, body mass index; CI, confidence interval; GAD-7, Generalized Anxiety Disorder Questionnaire; IQR, interquartile range; kg, kilogram; m: meter; MCID, minimal clinically important difference; n, sample size; PHQ-9, Patient Health Questionnaire; Post, postintervention/T1; SD, standard deviation; SF-12, Short Form 12 Health Survey; PSQ20, Perceived Stress Questionnaire, T0, Baseline; T1, post-intervention; z, Wilcoxon signed-rank test; r, effect size. $p < 0.001$ is considered as statistically significant.

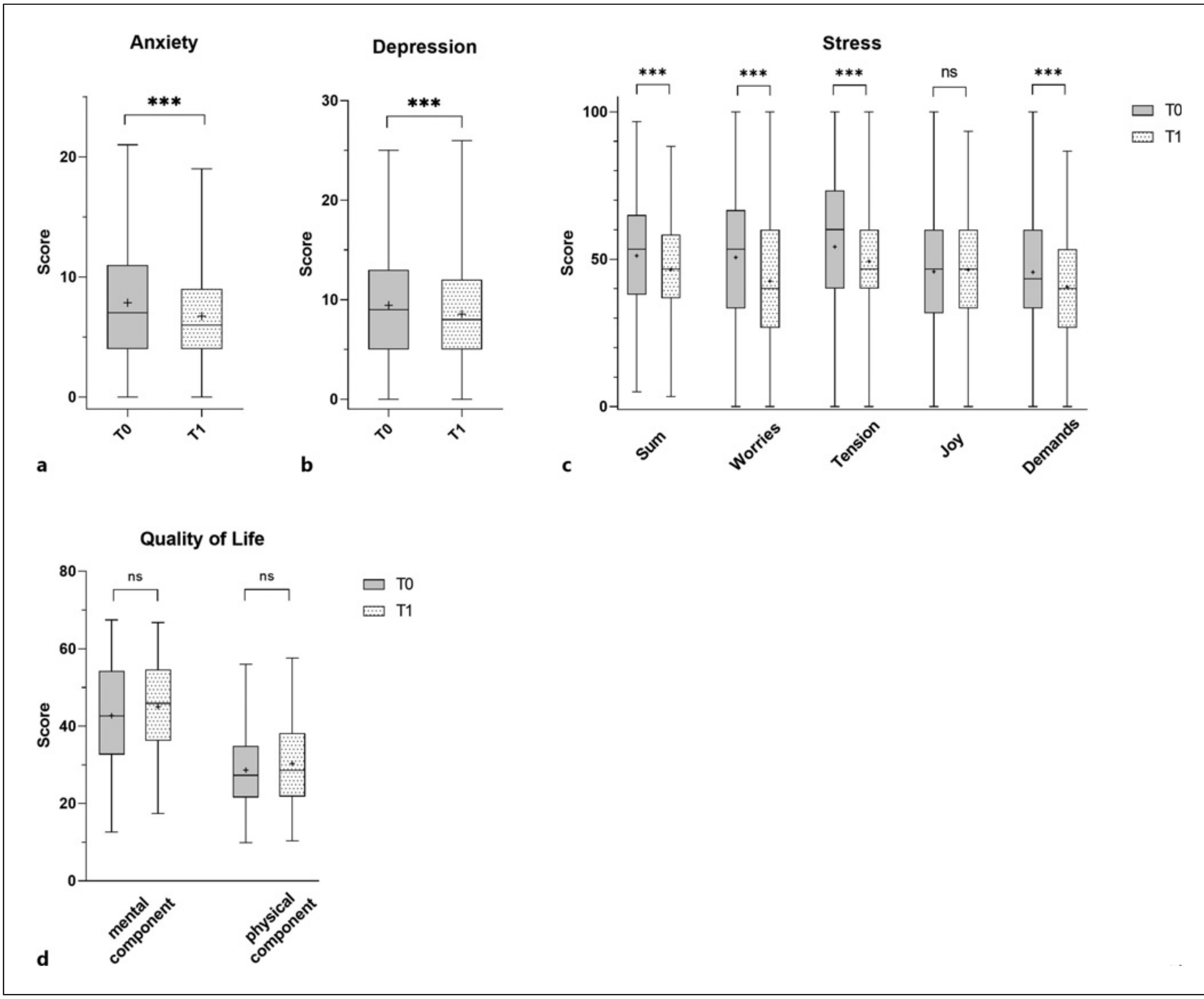

Fig. 1. Change of outcomes for the total study population for pre- (T0) and postintervention (T1): Scores for anxiety (**a**), depression (**b**), stress (**c**), and quality of life (**d**) are presented. The data are shown as box whiskers (median with upper and lower quartiles), whose difference describes the interquartile range (IQR) and minimum and maximum (=whiskers). The mean is depicted as "+." High levels for anxiety, depression, and stress indicate high symptomatic and stress levels, whereas high levels for quality of life imply high quality of life. ***Significant differences between T0 and T1 ($p < 0.001$). ns, no significant differences between T0 and T1.

Several reviews have investigated preoperative interventions but focused on the effects on weight-related outcomes [20, 36, 37]. Only a few reviews specifically explored the impact of these interventions on psychological well-being and found improvements in this aspect [20, 22, 36–40]. However, a proportion of participants (10–30%, depending on the symptom) did not experience optimal psychological stabilization through the intervention. Further attention, such as CBT prior to surgery, may be beneficial for this subgroup and could potentially reduce the risk of surgical failure.

From the patients' perspective, the program was considered a supportive method for preoperative preparation. These results are consistent with David et al. who also reported high usefulness and satisfaction of psychosocial interventions for MBS patients [38]. However, no distinctions between preoperative and postoperative interventions were made. It is interesting to note that patients who experienced a worsening in terms of MCIDs also evaluated the bridging program as beneficial. This finding suggests that participants may have perceived

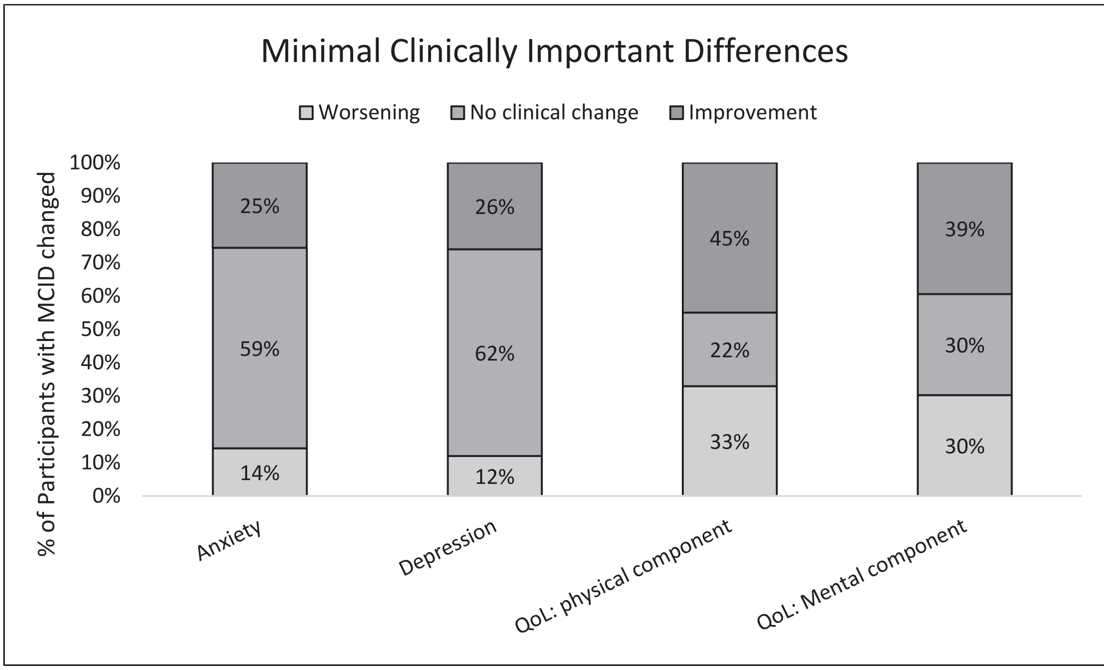

Fig. 2. Change of MCIDs from pre- (T0) to postintervention (T1). Data are presented as bar graphs showing the percentage of participants who achieved a minimum clinically important difference in each questionnaire T0 and T1.

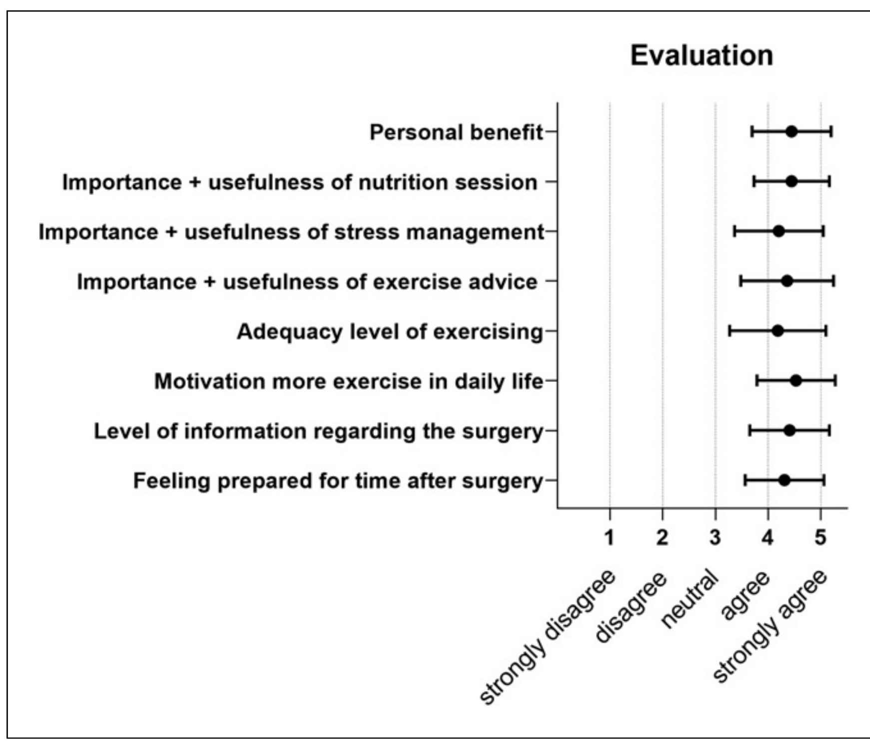

Fig. 3. Evaluation assessment of the total group: The results of the evaluation questionnaire regarding participants' personal benefits from the program are presented on a 5-point Likert scale.

Table 5. Changes of outcomes for subgroups (ITT)

	Face-to-face group (*N* = 222)	Videoconference group (*N* = 66)	Statistics for face-to-face versus videoconference		
			ANOVA	Van der Waerden	Differences between MCIDs
Anxiety [GAD-7]					
$Mean_{Post}$ (SD) [95% CI]	6.6 (4.3) [6.1–7.2]	7.0 (4.1) [6.0–8.0]	F_{Inter} (1, 278) = 0.055,	χ^2_{Inter} (1) = 0.800,	
ΔMean between T0 and T1, SD	−1.1 (4.3)	−1.5 (4.2)	*p* = 0.815, η_p2 = 0.001	*p* = 0.371	U = 7,083.000, *p* = 0.981
$Median_{Post}$ [IQR]	6.0 [3.0–9.0]	7.0 [4.0–10.0]			
MCID improved, *n* (%)	554 (24.3)	16 (24.2)	F_{Time} (1, 278) = 11.092,	χ^2_{Time} (1) = 7.095,	
MCID did not change, *n* (%)	130 (58.6)	40 (60.6)	*p* <0.001, η^2_p = 0.038	*p* = 0.008	
MCID worsened, *n* (%)	31 (14.0)	10 (15.2)			
Depression [PHQ-9]					
$Mean_{Post}$ (SD) [95% CI]	8.5 (5.0) [7.7–9.2]	8.5 (5.4) [7.1–9.8]	F_{Inter} (1, 236) = 0.102,	χ^2_{Inter} (1) = 0.114,	
ΔMean between T0 and T1 (SD)	−0.8 (4.6)	−1.0 (4.7)	*p* = 0.750, η^2_p = 0.001	*p* = 0.736	U = 4,880.500, *p* = 0.089
$Median_{Post}$ [IQR]	8.0 [5.0–12.0]	8.0 [4.3–11.8]			
MCID improved, *n* (%)	39 (17.6)	21 (31.8)	F_{Time} (1, 236) = 7.913,	χ^2_{Time} (1) = 7.095,	
MCID did not change, *n* (%)	115 (51.8)	34 (51.5)	*p* = 0.005, η^2_p = 0.039	*p* = 0.002	
MCID worsened, *n* (%)	20 (9.0)	9 (13.6)			
Perceived Stress (PSQ20)					
(a) Overall Score					
$Mean_{Post}$ (SD) [95% CI]	46.3 (17.3) [44.0–48.6]	46.1 (17.3) [41.8–50.4]	F_{Inter} (1, 279) = 1.579, *p* = 0.210, η^2_p = 0.011	χ^2_{Inter} (1) = 0.428, *p* = 0.513	
ΔMean between T0 and T1 (SD)	−4.3 (14.6)	−7.6 (15.3)			MCID not available
$Median_{Post}$ [IQR]	45.0 [36.7–58.3]	48.3 [33.3–57.5]	F_{Time} (1, 279) = 25.381, *p* <0.001, η^2_p = 0.088	χ^2_{Time} (1) = 21.854, *p* <0.001	
(b) Worries					
$Mean_{Post}$ (SD) [95% CI]	46.3 (17.3) [44.0–48.6]	46.1 (17.3) [41.8–50.4]	F_{Inter} (1, 279) = 0.074, *p* = 0.785, η^2_p = 0.001	χ^2_{Inter} (1) = 0.428, *p* = 0.513	
ΔMean between T0 and T1 (SD)	−4.3 (14.6)	−7.6 (15.3)			MCID not available
$Median_{Post}$ [IQR]	45.0 [36.7–58.3]	48.3 [33.3–57.5]	F_{Time} (1, 279) = 28.427, *p* <0.001, η^2_p = 0.098	χ^2_{Time} (1) = 14.410, *p* <0.001	

Table 5 (continued)

	Face-to-face group (*N* = 222)	Videoconference group (*N* = 66)	Statistics for face-to-face versus videoconference		
			ANOVA	Van der Waerden	Differences between MCIDs
(c) Tension					
$Mean_{Post}$ (SD) [95% CI]	49.0 (19.4) [46–51.7]	49.1 (21.5) [43.8–54.5]	F_{Inter} (1, 279) = 2.998, $p = 0.084$, $\eta_p^2 = 0.015$	χ^2_{Inter} (1) = 0.959, $p = 0.327$	
ΔMean between T0 and T1 (SD)	−4.2 (19.2)	−9.0 (17.9)			MCID not available
$Median_{Post}$ [IQR]	46.7 [40.0–60.0]	53.3 [33.3–66.7]	F_{Time} (1, 279) = 19.192, $p < 0.001$, $\eta_p^2 = 0.073$	χ^2_{Time} (1) = 18.294, $p < 0.001$	
(d) Joy					
$Mean_{Post}$ (SD) [95% CI]	46.5 (19.6) [43.8–49.1]	46.8 (20.0) [41.8–51.7]	F_{Inter} (1, 279) = 0.497, $p = 0.481$, $\eta_p^2 = 0.004$	χ^2_{Inter} (1) = 0.090, $p = 0.764$	
ΔMean between T0 and T1 (SD)	+0.5 (19.1)	+3.4 (21.7)			MCID not available
$Median_{Post}$ [IQR]	46.7 [33.3–60.0]	46.7 [33.3–60.0]	F_{Time} (1, 279) = 0.937, $p = 0.334$, $\eta_p^2 = 0.002$	χ^2_{Time} (1) = 1.562, $p = 0.211$	
(e) Demands					
$Mean_{Post}$ (SD) [95% CI]	40.9 (17.9) [38.5–43.3]	46.8 (20.0) [41.8–51.7]	F_{Inter} (1, 279) = 1.768, $p = 0.185$, $\eta_p^2 = 0.011$	χ^2_{Inter} (1) = 0.134, $p = 0.714$	
ΔMean between T0 and T1 (SD)	−4.4 (17.5)	−8.3 (17.3)			MCID not available
$Median_{Post}$ [IQR]	40.0 [26.7–53.3]	46.7 [33.3–60.0]	F_{Time} (1, 279) = 23.597, $p <0.001$, $\eta_p^2 = 0.076$	χ^2_{Time} (1) = 13.291, $p <0.001$	
Quality of Life [SF-12]					
(a) Mental Sum score					
$Mean_{Post}$ (SD) [95% CI]	45.2 (11.0) [43.7–46.7]	44.8 (12.0) [41.8–47.8]	F_{Inter} (1, 284) = 3.872, $p = 0.05$, $\eta_p^2 = 0.016$	χ^2_{Inter} (1) = 1.207, $p = 0.271$	
ΔMean between T0 and T1 (SD)	+2.2 (10.9)	+4.2 (10.3)			U = 6,653.000, $p = 0.330$
$Median_{Post}$ [IQR]	46.2 [38.6–53.9]	45.4 [35.1–55.4]			
MCID improved, *n* (%)	96 (43.2)	34 (51.5)	F_{Time} (1, 284) = 17.328, $p <0.001$, $\eta_p^2 = 0.071$	χ^2_{Time} (1) = 8.278, $p = 0.004$	
MCID did not change, *n* (%)	47 (21.2)	14 (21.2)			
MCID worsened, *n* (%)	78 (35.1)	17 (25.8)			

Table 5 (continued)

	Face-to-face group (*N* = 222)	Videoconference group (*N* = 66)	Statistics for face-to-face versus videoconference: ANOVA	Van der Waerden	Differences between MCIDs
(b) Physical Sum score					
$Mean_{Post}$ (SD) [95% CI]	30.3 (10.7) [28.9–31.7]	29.6 (9.6) [27.2–32.0]	F_{Inter} (1, 284) = 0.000, *p* = 0.983, η_p^2 = 0.008	χ^2_{Inter} (1) = 1.939, *p* = 0.164	
ΔMean between T0 and T1 (SD)	+1.6 (9.9)	+2.0 (8.1)			U = 7,129.500, *p* = 0.923
$Median_{Post}$ [IQR]	28.1 [21.5–38.5]	28.3 [23.3–36.1]			
MCID improved, *n* (%)	84 (37.8)	28 (42.4)	F_{Time} (1, 284) = 5.710, *p* = 0.018, η_p^2 = 0.006	χ^2_{Time} (1) = 3.278, *p* = 0.007	
MCID did not change, *n* (%)	69 (31.1)	19 (28.8)			
MCID worsened, *n* (%)	68 (30.6)	18 (27.3)			

value in the program beyond the immediate reduction of symptoms.

Overall, appropriate support prior to surgery in terms of patient education is important and necessary and as shown here, can stabilize patients psychologically at the same time so that the transition phase prior to surgery is bridged in a beneficial way. Short and easy-to-implement preoperative interventions such as this educational program should be a standard part of the care pathway for individuals undergoing MBS, providing patients with realistic information about the procedure and its outcomes, associated changes, potential complications, and necessary behavioral changes. Addressing these issues is important because people who are overweight, especially those who have tried and failed to lose weight, often have unrealistic expectations about MBS as a treatment option, reflecting a general lack of knowledge in this area [41–43].

While preoperative programs may not prevent all postoperative issues or unsuccessful weight loss [16], they can potentially have a positive influence during the postoperative period. Educated patients may be more willing to seek and accept postoperative support, which may contribute to better outcomes [40, 44, 45], but this is speculative at this point since results are mixed [46].

Finally, an important finding of the study is that both face-to-face and videoconference delivery were similarly effective in stabilizing and improving the psychological situation of participants. Additionally, the personal benefit of the intervention was reported as equivalent. Acceptance of online interventions has been shown to be high in various studies considering the advantages of online programs, such as reduced travel time and costs, and increased accessibility for individuals in rural areas [27, 47]. Adherence of participants, which is an important and critical factor for treatment success, can be even increased with online delivery in certain cases [48, 49].

There are strengths and limitations of this study. To the best of our knowledge, there are no comparable intervention programs that target the preoperative period while simultaneously serving to psychologically stabilize patients undergoing surgery. While more complex CBT interventions prior to surgery may be relevant for certain subgroups of patients, the program offers a general low-threshold preparation for all patients undergoing surgery. This approach ensures that a wide range of patients can benefit from the intervention. The low dropout rate of 3% indicated that the program had high adherence among participants, and it suggests that short programs with catch-up appointments can effectively engage and retain participants. The use of validated questionnaires enhances the reliability of the findings. In addition, the results are very robust since the comparison of delivery modes (face-to-face vs. videoconference) demonstrated similar results.

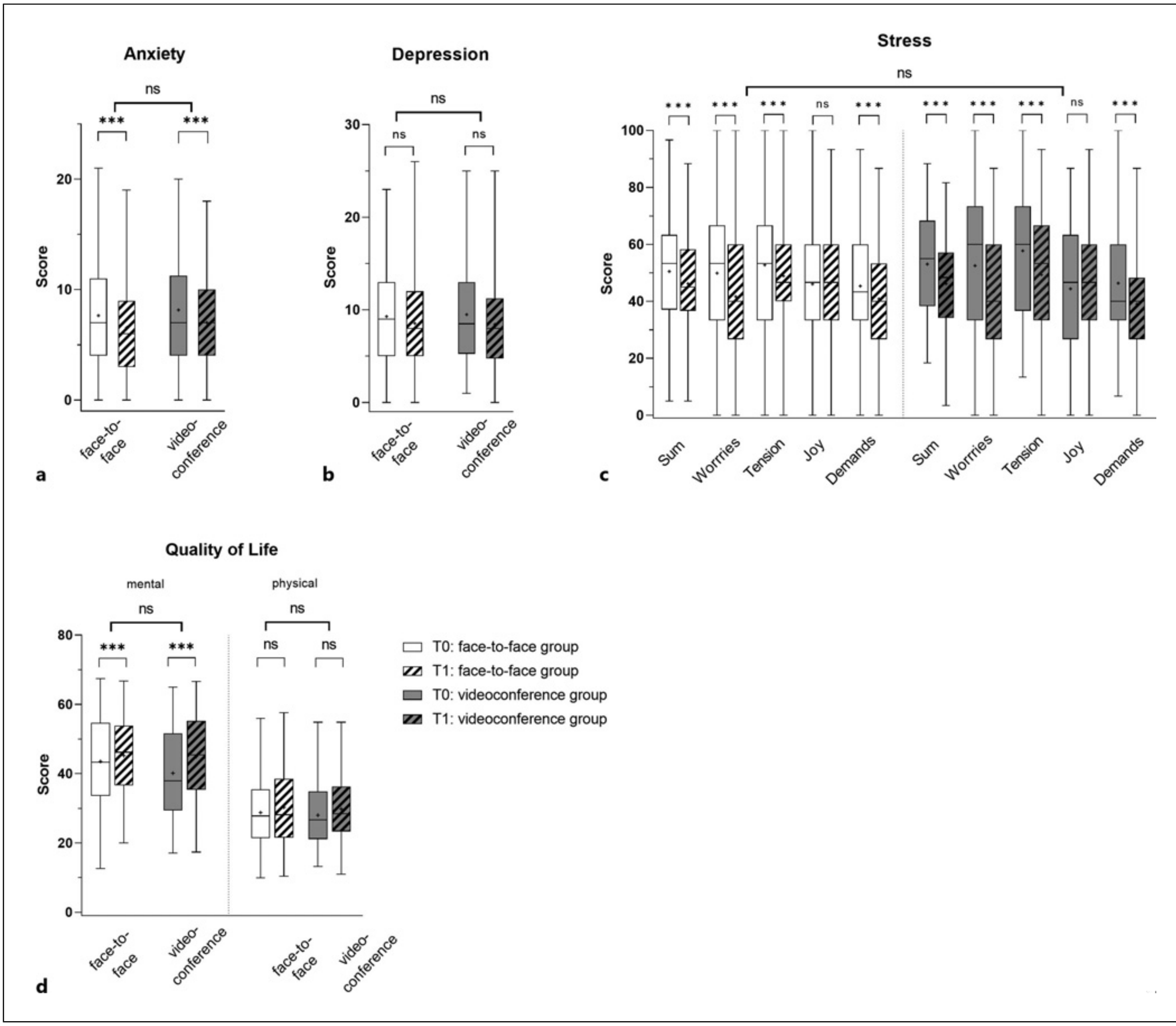

Fig. 4. Change of outcomes for the subgroups face-to-face and videoconference for pre- (T0) and postintervention (T1): scores for anxiety (**a**), depression (**b**), stress (**c**), and quality of life (**d**) are presented. The data are presented as box whiskers (median with upper and lower quartiles), whose difference describes the interquartile range (IQR) and minimum and maximum (=whiskers). The mean is depicted as "+." High levels for anxiety, depression, and stress indicate high symptomatic and stress levels, whereas high levels for quality of life imply high quality of life. Statistics for time × group interactions and main effect time are indicated: ***Significant difference ($p < 0.001$). ns, not significant.

One limitation of this study is the uncontrolled study design. Besides, no postoperative data were analyzed to examine the effect of the program on mental health status after surgery to evaluate whether psychological stabilization is maintained in the postoperative period. However, we do not expect an improved postoperative outcome since even more complex preoperative CBT showed only postinterventional effects that were not detectable in the postoperative period [23, 25, 38]. Further research should include postoperative follow-up, especially of participants whose mental health does not improve or stabilize during surgery preparation, to determine if these are the individuals who will not succeed after MBS. Additionally, the study's classification into subgroups based on the mode of delivery (face-to-face vs. videoconferencing) was a time-based classification due to the COVID-19 pandemic. However, research showed that psychological distress associated with COVID-19 returned to its original level over the course of the pandemic [50, 51], and statistical analyses showed no differences at baseline or interaction effects between subgroups, so the results of the comparison can be considered reliable, and therefore the program can be well offered and delivered as a videoconference-based delivery mode.

Conclusion

We consider the educational program to be an effective and easy-to-implement intervention to bridge the gap in preoperative preparation for MBS while also stabilizing the mental health of participants. In addition, the program was very well appreciated. Online participation via video conferencing can be offered as an equivalent option to face-to-face courses.

Statement of Ethics

This study protocol was reviewed and approved by the Ethics Committee of the University Hospital Tuebingen, Germany, Approval No. 884/2019BO2 in compliance with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Written informed consent was obtained from all individual participants included in the study.

Conflict of Interest Statement

The authors declare no conflicts of interest.

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Author Contributions

Conceptualization and writing – original draft preparation: I.M. and T.L.; methodology: T.L., J.S., B.K., S.Z., R.A., A.N., G.E., and I.M.; data curation: T.L., J.S., B.K., and S.S.; data analysis: T.L., J.S., and I.M.; visualization: T.L., : writing – review and editing: all authors; supervision: I.M.; project administration: I.M., A.S., S.Z., A.N., G.E., S.Z., All authors have read and agreed to the published version of the manuscript.

Data Availability Statement

The data that support the findings of this study are not publicly available due to the fact that they contain information that could compromise the privacy of the research participants but are available from the corresponding author upon reasonable request.

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Supplementary Material 1

Psychological Benefits of a Preoperative Educational Bridging Program for Bariatric Surgery: Does Face-to-Face versus Videoconference-Based Delivery Make a Difference? (Lau et al., Obesity Facts, 2024)

Materials and Methods

Data were analyzed from May 2014 (start of the program) to August 2022. The Ethics Committee approved this study, which is registered under the number 884/2019/BO2.

1. Treatment

The Viadukt II program is an educational program offered at the University Hospital Tuebingen to patients with obesity, primarily those with class 3 obesity. These patients have undergone conservative therapies according to the guidelines but still need to exhaust conservative methods before qualifying for bariatric surgery as the next-step in guideline-based therapy. The program aims to bridge the time to bariatric surgery by i) educating and preparing the patients for surgery and the period thereafter as well as to ii) physically and psychologically stabilize them and motivate for healthy lifestyle changes. The two-week protein diet prior to bariatric surgery to reduce weight and minimize the risk of surgery is not part of this course and is done separately afterwards. The program lasts three months and consists of four theoretical and three exercise sessions. Theoretical sessions cover topics such as preoperative nutrition, postoperative nutrition, behavior regarding nutrition and stress, and exercise theory (see Table 1). The program is in accordance with the requirements of the German guideline for the clinical treatment of obesity [1]. Originally, the program was conducted as face-to-face group meetings. Due to the COVID-19 pandemic, the in-person version was transformed into an online intervention via a video conferencing platform. The content of the program remained identical. The face-to-face sessions were attended by 12 participants and each session lasted 90 minutes, while the videoconference-based sessions had no more than 10 participants and lasted one hour each.

In case of 100% participation, program costs were covered by health insurance. Less than 100% attendance was classified as dropout. Since the program consisted of only a few sessions, missed sessions could easily be rescheduled.

2. Participants

Participants were recruited through the multidisciplinary obesity service at the University Hospital, which consists of a team from sports medicine, endocrinology and diabetes, nutritional medicine, psychosomatic medicine, and visceral surgery. The multidisciplinary obesity service is the initial point of contact for bariatric surgery and recommends the treatment pathway. This study included participants who were at least 18 years old and had a BMI greater than 35 kg/m² with comorbidities or greater than 40 kg/m² without comorbidities. Participants with language difficulties were excluded as the program was only offered in German.

3. Outcomes

Baseline data were collected at the start of the intervention (T0) and included socioeconomic characteristics, body weight, body height, and questionnaires assessing anxiety (GAD-7), depression (PHQ-9), perceived stress (PSQ-20), and quality of life (SF-12). At the end of the program (T1), but before surgery, the same four questionnaires were completed, and weight was measured again. Body weight was measured in kilograms using a calibrated scale (Seca 701; Vogel & Halke, Hamburg, Germany), with participants not wearing shoes and only light clothes. Height was measured in centimeters using a stadiometer at baseline. In the videoconference subgroup, body weight and height were self-reported. Previous literature shows that self-assessment of body weight is correct even in individuals with obesity [2, 3].

The questionnaires used to assess psychometrics are described in detail below. In addition, Minimal Clinically Important Differences (MCIDs) for the questionnaires were reported when available, and the percentages of participants achieving MCIDs (improvement or worsening) were calculated. The MCID is defined as the smallest change in a clinical outcome measure that is considered meaningful and relevant to patients [4, 5].

GAD-7:

The Generalized Anxiety Disorder Scale-7 (GAD-7) is a questionnaire used to assess generalized anxiety disorder based on the criteria of the Diagnostic and Statistical Manual of Mental Disorders IV. The questionnaire consists of seven questions, and the response options include "not at all", "some days", "more than half of the days" and "almost every day". The total score obtained from the questionnaire indicates the possible presence and severity of an anxiety disorder. Scores ranges from 0 to 21 and can be classified as minimal (0-4), mild (5-9), moderate (10-14) or severe (15-21) anxiety [6]. The MCID for anxiety was set at four points [7].

PHQ-9:

The Patient Health Questionnaire (PHQ-9) is a screening tool used to assess the presence and severity of depressive disorders. The questionnaire, also derived from the Diagnostic and Statistical Manual of Mental Disorders IV, consists of nine items with response options including “not at all”, “several days”, “more than half of the days”, or “nearly every day”. The sum of the answered questions results in a score ranging from 0 to 27. The severity of the depression can be categorized as none to minimal (0-4), mild (5-9), moderate (10-14), moderately severe (15-19) or severe (20-27). Patients with symptoms of major depression, the most common depressive disorder, typically have a score of ten or higher [8, 9]. A change of four points is considered an MCID [10].

PSQ-20:

The German version of the Perceived Stress Questionnaire-20 (PSQ-20) was used to assess stress experience. It consists of 20 items divided into four subscales: worries, tension, joy and demands. Participants rate the items on a 4-point Likert scale from "almost never" (1) "sometimes" (2) and "frequently" (3) to "most of the time" (4). A summated score is calculated, resulting in a scale ranging from 0 to 100, with higher values indicating a greater expression of the respective construct [11, 12]. The PSQ-20 does not have a defined MCID due to a lack of literature.

SF-12:

The Short Form Health-Survey 12 (SF-12) was used to assess health-related quality of life. It is a shortened version of the SF-36 and consists of 12 questions that cover eight categories of health status: physical functioning, physical role, bodily pain, general health, vitality, social functioning, emotional role, and mental health. The analysis of the questionnaire results in a mental and a physical sum value, which are then compared to the general U.S. population as a reference group. The average sum value is 50 (SD = 10). Higher scores indicate better health conditions, while lower scores represent worse health status [13, 14]. The MCID is set at a value of three points [15].

For reliability analysis, Cronbach's alpha was calculated to assess the internal consistency of all questionnaires. For the SF-12, an internal consistency of $\alpha = 0.81$ was calculated for the mental component and $\alpha = 0.84$ for the physical component. The GAD-7 had a Cronbach's alpha of 0.88, and the PHQ-9 had an internal consistency of $\alpha = 0.84$. For the psq20, the "worry" subscale has an internal consistency of $\alpha = 0.83$, the "tension" subscale of $\alpha = 0.80$, the "joy" subscale of $\alpha = 0.75$, and the "demands" subscale of $\alpha = 0.73$.

These questionnaires have been used and validated in patients with obesity to assess anxiety [16], depression [17], quality of life [18, 19] and perceived stress [20] and in addition, also in patients undergoing or after MBS to asses anxiety [21], depression [22, 23], quality of life [18] and perceived stress [24].

Personal Benefit:

In addition to the psychometric questionnaires, participants were asked to complete an evaluation questionnaire at the end of the intervention. The evaluation ad hoc questionnaire was designed to assess the participants' satisfaction with the intervention. It consists of eight questions regarding personal benefits, importance and usefulness of the different theory sessions, adequacy of the exercise level, motivation to incorporate exercise into daily life, level of information about surgery, and whether participants felt prepared for the time after bariatric surgery. Participants responded to the questions using a 5-point Likert scale from "strongly disagree" (1)," disagree" (2), "neither agree nor disagree" (3), "agree" (4) to "strongly agree (5)". Additionally, participants were asked if they would recommend the program.

4. Statistical Analysis

Statistical analysis was performed using IBM SPSS Statistics for Windows software, version 29.0 [IBM Corp. Released 2021. IBM SPSS Statistics for Windows, Version 28.0. Armonk, NY: IBM Corp]. Data were reported as mean (standard deviation, SD), confidence interval (CI) and median with 25^{th} and 75^{th} percentiles (interquartile range, IQR). Frequencies were expressed as percentages (%). The Shapiro-Wilk test was used to assess the normal distribution of continuous variables, and Levene's test was used to test for equality of variances between subgroups. The nonparametric Wilcoxon signed-rank test was applied to test differences in psychometrics and body weight between the beginning (T0) and end (T1) of the intervention for the entire study group. For the subgroup analysis, participants who attended both face-to-face and videoconference-delivered courses during the transition process (from normal to COVID-19 situation) were excluded in order to ensure a clear distinction between the two course formats. Therefore, the sample size for the subgroups analyses differs from the total sample size. Baseline differences between the subgroups "face-to-face" versus "videoconference" treatment were analyzed with the Mann-Whitney U-test for non-parametric data and the chi-square-test or Fisher-Freeman-Halton's exact test for nominal data. To address possible differences due to unequal group sizes, face-to-face cases were matched with cases participating in the videoconference-based cohort based on age, gender, and BMI (hereafter referred to as face-to-face$_{Match}$ and videoconference$_{Match}$). To examine interactions between subgroups ("face-to-face" vs. "videoconference") and time (T0 vs. T1) a 2x2 ANOVA with main effects for time as a within-subjects variable and subgroup as a between-subjects variable was conducted. Despite the non-normally distributed data, the ANOVA was used as this method is considered very robust [25]. The Van der Waerden test for nonparametric data was also applied to validate the results [26]. Additional analyses for the perception of program benefits of patients that did not stabilize or improve psychologically as a result of the program (i.e., those who were in the categories "MCID worsened") were conducted in comparison to the rest of the group by the Mann-Whitney U-test. Throughout the manuscript, two-sided tests were used for calculating results. To control for α-error, a significance level of $p < .001$ was considered statistically significant, while p-values between .001 and .05 were considered as trend. Effect sizes were defined as follows: r of 0.1 = small effect, 0.3 = medium effect, 0.5 = large effect [27], and for partial eta squared: 0.01: small effect size, 0.06: medium effect size, 0.14 or higher: large effect size [28].

Data imputation:

Missing values were imputed using the predictive mean matching method after applying Little's test to assess whether the missing data were randomly distributed [29]. Age and sex were used as predictors for GAD-7, PHQ-9, PSQ-20 and SF-12 questionnaires. For weight and BMI, body weight at baseline was added as a predictor.

Multiple imputation with five iterations was performed to impute missing data in the questionnaires. This process was applied to single missing values at baseline and post-intervention, as well as to completely missing questionnaires at the post-intervention assessment. [30-32]. The per-protocol analysis included cases with single missing values, while the intention-to-treat (ITT) population included cases with complete missing questionnaires at the end of the intervention and/or single value imputations.

The percentage of missing data for complete questionnaires ranged from 15.3% to 29.4% for anxiety, depression, perceived stress, and quality of life at T0 or T1. Specifically, for anxiety: T0 = 17.2% (n = 62), T1 = 24.2% (n = 87); depression: T0 = 29.4 (n = 106), T1= 29.4% (n = 106); stress: T0 = 16.9% (n = 61), T1 = 24.7% (n = 89); and quality of life: T0 = 15.6% (n = 56), T1 = 23.6% (n = 85). The lower number of completed questionnaires on depressive symptoms was due to their introduction later in the program.

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3. Discussion

3.1. Main Findings

The two contributions of this thesis focused on the impact of lifestyle and educational programs on weight-related parameters, as well as their broader benefits on mental health and patient perspectives for individuals with obesity preparing for MBS.

The central research questions addressed in this thesis were:

I) What is the impact of preoperative lifestyle and educational interventions before MBS on weight-related outcomes?
II) How do preoperative lifestyle and educational programs affect mental health and patient satisfaction?
III) Is online delivery via videoconferencing of preoperative lifestyle and educational programs equivalent to in-person intervention?

To contribute to the knowledge on these issues, this thesis analyzed the effects of various parameters through participation in a preoperative lifestyle and educational program. The first paper examined differences in BMI reduction at various time points between an intervention group that participated in a preoperative educational program and a control group. This analysis was conducted through a systematic review and meta-analysis, focusing exclusively on RCTs. The second contribution explored the effects of the program on mental health and patient perspectives, using a longitudinal approach that assessed changes before and after the intervention under controlled inpatient conditions.

Contribution 1, a systematic review and meta-analysis (Lau et al., 2023), investigated the benefits of preoperative lifestyle interventions on weight-related outcomes after metabolic and bariatric surgery. The study found that while preoperative lifestyle interventions had short-term effects on weight-related outcomes immediately after the intervention, there were no significant long-term effects on weight one year after MBS. Contribution 2, an original research article (Lau et al., 2024), investigated the effects of a lifestyle and educational program before MBS on patients' mental health and perspectives, beyond just weight loss. The study found that short educational programs prior to MBS can significantly improve symptoms of depression, anxiety, and stress with participants also reporting high satisfaction and personal benefits.

3.1.1. Impact of preoperative lifestyle and educational interventions before MBS on weight-related outcomes

The first contribution investigated the impact of preoperative lifestyle and educational programs on weight-related parameters at different time points, showing a significant reduction in BMI post-intervention but before MBS, compared to a control group receiving usual care. The second contribution found only minimal changes in weight and BMI post-intervention but did demonstrate weight stabilization through the intervention.

Our findings align with other reviews and meta-analyses showing that participation in preoperative lifestyle and education programs can lead to short-term weight loss detectable in the preoperative period (Brazil *et al.* 2021, Lodewijks *et al.* 2022, Ochner *et al.* 2012). Roman et al. concluded that preoperative weight loss programs are effective, resulting in significant weight loss prior to MBS compared to controls, although their inclusion criteria were less strict, encompassing cohort studies and studies with unclear intervention types (Roman *et al.* 2019). Similarly, Lodewijks et al., who also included non-RCTs, found that preoperative weight loss programs were beneficial for preoperative weight loss (Lodewijks *et al.* 2022).

Regarding postoperative weight loss outcomes, it is important to note that some reviews have combined different types of preoperative interventions in their analyses, including insurance-mandated weight loss without structured interventions, physician-mandated weight loss, and lifestyle programs (Anderin *et al.* 2015, Kushner *et al.* 2021, Ochner *et al.* 2012, Tewksbury *et al.* 2017). Therefore, these analyses require careful interpretation. To address this issue, our analysis in publication 1 focused solely on preoperative lifestyle and educational interventions and found that, one year after MBS, both the intervention and control groups had similar BMI reductions, which is consistent with other reviews and meta-analysis (Kushner *et al.* 2021, Lodewijks *et al.* 2022, Tewksbury *et al.* 2017). Only a few studies indicated potential benefits from preoperative interventions, but they were based on less robust data (Brazil *et al.* 2021, Kim *et al.* 2016, Tewksbury *et al.* 2017). A recent systematic review by Lodewijks et al. also found no advantages of preoperative lifestyle interventions on postoperative weight outcomes (Lodewijks *et al.* 2022). In addition, Lodewijks et al. conducted a trial examining "additional preparation programs focused on diet and behavior modification rather than weight loss". Their findings indicated that percentage total weight loss differed significantly and was in favor of standard care after two years (Lodewijks *et al.* 2023). The authors concluded that not providing an additional preoperative program can result in a similar percentage of weight loss two years after surgery, questioning the use of additional preoperative preparation. However, their study may have introduced selection bias, as patients were assigned to the intervention group based on a multidisciplinary team's assessment, potentially comparing patients with varying levels of disease burden. In line, Brazil et al. conclude in their review that there is no evidence to support mandated participation in structured lifestyle programs prior to MBS as a requirement for improved clinical outcomes. They assert that these programs should not be compulsory for preoperative assessment and preparation (Brazil *et al.* 2021).

The impact of reduced BMI post-intervention on weight status after MBS remains unclear due to limited studies. Evidence from non-RCT designs suggests that preoperative weight loss success or failure does not significantly impact postoperative weight loss, implying that preoperative weight loss is not a key factor in long-term success (Lau *et al.* 2023). Conversely, data from the Scandinavian Obesity Registry suggested a relationship between the extent of preoperative weight loss and postoperative outcomes. However, their preoperative regimens were not standardized, and participation in lifestyle interventions was not documented, leading to mixed and inconclusive results (Anderin *et al.* 2015). Although the weight loss observed in our analysis was modest, it is noteworthy because these studies did not require weight loss as a prerequisite for MBS (Lau *et al.* 2023). This suggests that even without mandated weight loss goals, patients were able to stabilize their weight. The likely reason is that the intervention motivated patients to immediately apply the knowledge gained, including dietary, exercise, and behavioral recommendations, leading to a healthier lifestyle and modest weight loss (Bauer *et al.* 2020, Kim *et al.* 2016). This highlights the value of lifestyle and educational programs in stabilizing and optimizing weight before MBS.

However, preoperative lifestyle and educational interventions may not result in greater postoperative weight loss, as MBS itself is a powerful intervention that overshadows minor preoperative achievements. The significant anatomical, hormonal, physiological, and energy-balance changes induced by MBS likely diminish the impact of preoperative weight loss efforts on long-term outcomes (Deutsche Gesellschaft für Allgemein- und Viszeralchirurgie 2018, Heshka *et al.* 2020, Mirahmadian *et al.* 2018). Interestingly, a review by David et al. also found that preoperative interventions had immediate benefits, but their effects did not persist into the postoperative period. However, they examined the impact of cognitive behavioral therapy, hypothesizing that intensive behavioral interventions may be more effective in addressing behavioral causes of obesity. potentially enhancing long-term weight loss outcomes (David *et al.* 2020). This suggests that even extensive preoperative interventions may not significantly improve postoperative weight loss.

To summarize, preoperative lifestyle intervention programs before MBS show short-term benefits for weight-related outcomes but have limited impact on postoperative weight loss.

3.1.2. Effect of preoperative lifestyle and educational programs on mental health and patient satisfaction

The first contribution primarily focused on weight-related parameters but also explored secondary outcomes. It was notable that other parameters such as mental health and patient satisfaction were rarely examined, infrequently and variably reported among the included RCTs, which limited the ability to conduct a comprehensive analysis.

Publication 1 highlighted the knowledge gap regarding the effects of preoperative interventions on parameters such as mental health and patient satisfaction. Therefore, Publication 2 was conducted to examine outcomes beyond weight loss. The second contribution found that participants with obesity had higher depression and anxiety scores compared to the normal-weight population, indicating greater psychological stress. These high baseline scores improved post-intervention. Our results showed that a group-based educational program before MBS improved patients' mental health. Using Minimal Clinically Important Differences (MCIDs) to assess clinical effects, most participants experienced stabilization or improvement in depression, anxiety, and stress (Lau *et al.* 2024). These findings align with Lodewijks et al., who observed a positive trend in improving mental health and physical activity post-intervention after participating in additional preoperative programs (Lodewijks *et al.* 2022).

More extended psychosocial interventions, such as CBT, have also been effective in improving eating pathology and psychosocial functioning in the preoperative period (David *et al.* 2020). However, it is questionable whether all MBS patients require such an intensive approach when our results showed that even a short intervention stabilized mental health (Lau *et al.* 2024). The disadvantage of CBT-based psychosocial interventions is that they are much more complex, time consuming and expensive to implement than our short intervention (Brettschneider *et al.* 2015, Ross *et al.* 2019). Additionally, the beneficial effects of more extensive preoperative CBT on eating behavior and psychological symptoms postintervention did not extend to the period one year after MBS. As a result, the authors concluded that preoperative psychosocial interventions do not significantly contribute to postoperative outcomes (David *et al.* 2020, Paul *et al.* 2021).

Other reviews explored the optimal timing of lifestyle interventions in relation to MBS, often comparing preoperative and postoperative interventions. Postoperative programs were generally rated as more effective. These reviews suggested that the optimal time to start treatment may be in the early postoperative period, before significant problematic eating behaviors and weight regain occur (Hachem *et al.* 2016, Jastreboff *et al.* 2023, Kim *et al.* 2016). However, the data remains conflicting, as Jassil et al. found that an additional lifestyle program implemented immediately after MBS did not have a positive effect on weight loss and health outcomes (Jassil *et al.* 2023), and Noria et al. found that behavioral and exercise interventions postoperatively have not been effective in reversing weight regain once it has occurred (Noria *et al.* 2023). Following MBS, studies indicate that many patients experience a reduction in depressive symptoms, often attributed to weight loss and the associated improvements in physical health induced by surgery. However, the long-term effects on mental health are variable. While some patients may sustain these improvements and continue to experience relief from depressive symptoms, others may continue to struggle with depression or develop new depressive symptoms. Additionally, evidence suggests an increased risk of suicide in some cases, highlighting the importance of ongoing psychological support and monitoring post-surgery (MüllerHase *et al.* 2019, Sarwer *et al.* 2020).

Our results show that participants reported high levels of satisfaction and personal benefit from the preoperative program (Lau *et al.* 2024). These findings align with other studies, which also reported very high satisfaction and perceived usefulness of preoperative interventions (David *et al.* 2020, Goldstein *et al.* 2010, Groller *et al.* 2018, Lier *et al.* 2012). Patients often express various concerns and fears about undergoing MBS and want to be well-informed and prepared for the procedure. A recent study found that there are unmet informational needs before MBS (Breuing *et al.* 2022). The mandated programs focus more on fulfilling insurance requirements rather than providing helpful patient-centered information (Brazil *et al.* 2021, Kim *et al.* 2016, Tewksbury *et al.* 2017).

While there is a rationale that better understanding and satisfaction lead to better compliance, Lier et al. did not find a correlation between treatment satisfaction and compliance with treatment guidelines (Lier *et al.* 2012). Conversely, Schneider et al. found an association between unmet informational needs and lower satisfaction, with some patients even regretting their decision for MBS. They concluded that providing adequate knowledge improves patient autonomy and therefore decision-making (Schneider *et al.* 2016).

In our study, patients who experienced worsening in terms of MCIDs still evaluated the bridging program as beneficial (Lau *et al.* 2024). This finding suggests that participants may have perceived value in the program beyond immediate symptom reduction, appreciating the support, education, or other aspects of the intervention that contributed to their overall well-being.

3.1.3. Online delivery via videoconferencing of preoperative lifestyle and educational programs is equal to face-to-face intervention

Publication 2 assessed the effectiveness of online delivery as an alternative to in-person sessions. This shift to videoconferencing was necessitated by the COVID-19 pandemic, therefore the groups “face-to-face” vs. “videoconference” were classified based on the timing of the intervention during the pandemic (Lau *et al.* 2024). Two reviews on online interventions prior to MBS were inconclusive, highlighting the need for further research in this field (Coldebella *et al.* 2018, Messiah *et al.* 2020).

Research has shown that support from bariatric healthcare providers during the pre- and post-operative phase of MBS is linked to better weight loss outcomes (Tewksbury *et al*. 2017). However, many patients often miss crucial pre- and post-operative healthcare sessions due to several reasons. Coldebella et al. concluded that telemedicine has the potential to enhance the knowledge base of MBS patients in the preoperative phase and help prepare them for lifestyle change after MBS (Coldebella *et al.* 2018). Similarly, Messiah et al. emphasized the importance of measuring the acceptability of remote delivered and determining whether it improve MBS outcomes (Messiah *et al.* 2020). Our findings demonstrated that online interventions yielded equivalent results to in-person sessions across all psychological outcomes (Lau *et al.* 2024). Especially participants' perspectives did not differ between the two delivery modes and they rated the remote delivered intervention as particularly useful. These findings suggest that online formats could be a viable and cost-effective option for preoperative preparation. Online delivery can improve participant adherence, which is viewed as a crucial factor for treatment success, as it eliminates barriers such as travel time, costs, and accessibility, particularly for those in rural areas. Remote delivery and electronic communication methods facilitate patient-caregiver contact, help maintain continuity of care and reduce time and financial burdens (Bradley *et al.* 2018, Breuing *et al.* 2022, KalarchianKing *et al.* 2019, Kalarchian and Marcus 2019, Tewksbury *et al.* 2017).

In addition, the heightened risk of severe outcomes from COVID-19 in individuals with obesity, alongside other health risks, underlines the importance of continuing obesity treatment even during pandemic situations. The pandemic has highlighted the necessity of having alternatives to in-person sessions, as future pandemics or similar situations are likely to occur.

3.2. Implications

3.2.1. Implications for practice

This work confirmed that preoperative education and lifestyle programs can stabilize weight and improve mental health prior to MBS. These benefits can be strategically leveraged in the preparation phase before MBS. However, while these advantages are evident, making these programs mandatory for all MBS candidates may not be necessary, as MBS itself is a powerful intervention and minor preoperative weight loss does not seem critical for surgical outcomes (Deutsche Gesellschaft für Allgemein- und Viszeralchirurgie 2018, Heshka *et al.* 2020, Lau *et al.* 2023, Mirahmadian *et al.* 2018). Instead, preoperative programs could be especially beneficial for specific subgroups of patients, such as individuals who do not have a primary indication for MBS, and need to bridge time before MBS, patients with clinically significant mental health issues, individuals with unmet informational needs regarding MBS and required lifestyle changes, or individuals lacking adequate social support. These subgroups may benefit from targeted support that addresses preoperative risk factors and therefore mitigates potential postoperative challenges. Preoperative preparation should focus on providing comprehensive knowledge about MBS, including the procedure's mechanism, potential complications, and the importance of necessary behavioral changes regarding diet, exercise, and self-control.

Research on patients' perspectives regarding MBS is limited, but one study identified key factors contributing to perceived success, including achieving weight loss goals, adhering to lifestyle guidelines, and personal effort. Patients who achieved weight loss reported higher satisfaction and motivation, while those who struggled often relapsed into old habits and experienced negative emotions. Successful patients emphasized the importance of personal responsibility in following postoperative dietary guidelines (Groller *et al.* 2018). When patients understand how lifestyle modifications directly contribute to their MBS success – a perspective facilitated by preoperative programs - they are more likely to engage in lasting behavioral adjustments (Brazil *et al.* 2021, Murphy *et al.* 2024, Spreckley *et al.* 2021). Furthermore, preoperative programs can foster a positive mindset, provide non-judgmental guidance, which can enhance patients' autonomy and confidence, help patients maintain healthy behaviors and avoid frustration from unrealistic weight loss goals (Evert *et al.* 2017, Schneider *et al.* 2016). Another key benefit of preoperative programs is establishing a trusting relationship with healthcare providers, which is invaluable during the postoperative period. Studies indicate that the effectiveness of interventions increases with the frequency of patient-provider interactions, emphasizing the importance of regular communication (Tewksbury *et al.* 2017).

Setting realistic expectations for the postoperative period is essential for managing patient outcomes (Fruh 2017, Groller *et al.* 2018). While preoperative interventions have demonstrated positive initial effects in stabilizing weight and mental health, maintaining these benefits over the long term remains challenging. There is no conclusive evidence that these preoperative programs lead to sustained improvements after MBS (Brazil *et al.* 2021, David *et al.* 2020, Lodewijks *et al.* 2022). Studies showed that patients often face specific challenges postoperatively, such as nutritional issues (Breuing *et al.* 2022). Therefore, additional care and interventions may be necessary to sustain mental health benefits after MBS. For example, in cases of maladaptive behaviors or psychological issues, interventions like CBT, which explicitly addresses behavior and mental health, may be effective and could be an option for post-surgery implementation (Paul *et al.* 2022).

However, postoperative lifestyle interventions have not demonstrated a clinically meaningful impact on weight regain once it has occurred (David *et al.* 2020, Marshall *et al.* 2020). In addition, a study comparing a group undergoing a lifestyle intervention two years after MBS found no significant difference in weight regain compared to a control group, indicating that prophylactic interventions did not yield beneficial effects and underscoring the need for further research on postoperative lifestyle support (Hanvold *et al.* 2019).

An open question is the optimal timing for interventions. It may not be necessary to intervene until the "honeymoon period" of rapid weight loss ends, typically 1-2 years post-surgery. Patients experience rapid weight loss due to physiological and metabolic changes, but after this period, the body reaches a new energy balance, and as a result, weight loss slows or plateaus (Greenway 2015, Lynch 2016, Melby *et al.* 2017, Sjöström 2013). This phase is often associated with a decline in motivation and mental health, especially when patients feel they are losing control over their progress. Ongoing behavioral support and monitoring may be crucial at this point.

Regardless of the timing, continuous monitoring of mental health and weight post-surgery, along with tailored postoperative care programs seems to be essential for managing weight stabilization challenges (Bradley *et al.* 2018, Cohen *et al.* 2023, David *et al.* 2020, Kalarchian *et al.* 2018, Kalarchian and Marcus 2019).

The integration of digital tools, such as videoconferencing, can enhance communication between patients and providers, offering ongoing support, to improve adherence to lifestyle modifications (Bradley *et al.* 2018, Kalarchian *et al.* 2018, Wadden *et al.* 2023). Furthermore, the COVID-19 pandemic has exacerbated the obesity crisis, as increased time spent in home offices and higher consumption of processed and fast foods have contributed to weight regain (Bhutani *et al.* 2021). This situation underscored the importance of addressing obesity as a public health priority as obesity not only increases the risk of severe outcomes from COVID-19 but also places a significant burden on healthcare systems, highlighting the urgent need for effective public health strategies to combat this global health challenge (Huang *et al.* 2020).

3.2.2. Implications for further research

While short preoperative education and lifestyle programs may benefit certain subgroups, it remains unclear which patients could profit the most from additional support. Individuals without a primary indication for MBS, those with significant mental health issues, unmet informational needs, or limited social support could be particularly responsive to tailored interventions. Preoperative assessments combined with postoperative monitoring could clarify the effectiveness of this approach, potentially enhancing outcomes by preparing patients to better handle weight maintenance and lifestyle changes. Patients showing no mental health improvement preoperatively may need closer postoperative monitoring, as mental health decline could negatively impact weight and quality of life outcomes (Järvholm *et al.* 2020, KalarchianKing *et al.* 2019, MüllerNett *et al.* 2019).

Emerging anti-obesity medications (AOMs) offer promising weight loss results comparable to MBS, which may warrant a shift in research focus toward identifying the most appropriate therapeutic approach for each patient (Gutgesell *et al.* 2024, Jastreboff *et al.* 2023, Müller *et al.* 2022). Individual treatment pathways should be guided by comprehensive assessments, considering obesity degree, comorbidities, and eating behaviors (Brazil *et al.* 2021, Klair *et al.* 2023).

For moderate obesity with few comorbidities, initial weight loss through conservative methods may be enhanced by AOMs. If this step is insufficient, MBS may be more suitable, as it currently provides greater and more sustained weight loss (Alabduljabbar *et al.* 2023, Klair *et al.* 2023). For severe cases, MBS could be supported by AOMs for preoperative weight loss ("neoadjuvant anti-obesity medication") to reduce surgical risks and therefore optimizing the patient’s ability for surgery (Klair *et al.* 2023, Vosburg *et al.* 2022). However, it remains unclear whether the use of neoadjuvant anti-obesity medication improves post-surgical outcomes (Sher *et al.* 2024).

MBS may remain the preferred option in patients with significant comorbidities, such as diabetes, due to its high remission rates for metabolic diseases (Klair *et al.* 2023). For patients facing suboptimal MBS results, post-surgical pharmacotherapy (“adjuvant anti-obesity medication”) could enhance weight loss, improve metabolic outcomes, and manage weight regain. However, the optimal timing, duration, and combination of AOMs in the postoperative period remains unclear (Alabduljabbar *et al.* 2023, Klair *et al.* 2023, Sher *et al.* 2024, Vosburg *et al.* 2022).

While generally well-tolerated, AOM use requires monitoring for side effects such as gastrointestinal discomfort, including nausea (Alabduljabbar *et al.* 2023, Klair *et al.* 2023, Sher *et al.* 2024). Additionally, questions remain about whether AOM-induced weight loss effectively motivates lifestyle changes (Dehghani *et al.* 2024, Klair *et al.* 2023). Recent studies found that weight loss outcomes were similar between groups using AOM alone versus AOM combined with lifestyle interventions. However, after AOM discontinuation, patients regained around two-thirds of their lost weight. While AOM reduces energy intake, primarily by limiting portion sizes of the same high calorie, processed foods, it does not promote healthier eating habits essential for cardiometabolic improvements. The Authors concluded that dietary quality guidance is necessary for patients using AOMs (Wadden *et al.* 2023).

Furthermore, research emphasizes that AOMs impact physiological pathways that may complement behavioral interventions. However, behavioral changes address long-term health improvements beyond what medications alone can achieve. Although AOMs can aid in weight loss, they cannot replace the lifestyle changes critical for sustainable health improvements, and motivating patients to adopt healthier dietary and exercise habits remains a challenge when these are not strictly required for weight loss suggesting that both approaches are needed to comprehensively manage obesity (Lewis *et al.* 2024). This dual approach may not only improve patient health outcomes but also manage financial costs, as long-term AOM treatment could burden both healthcare systems and patients (Lewis *et al.* 2024, Vosburg *et al.* 2022, Wadden *et al.* 2023).

AOMs also require careful consideration in patients with a history of eating disorders, as significant weight loss could trigger negative cognitions or behavioral patterns (Wadden *et al.* 2023). Evidence suggests that GLP-1 agonists and GLP-1/GIP co-agonists may be particularly promising for these patients, as they act on neurobiological mechanisms that do not only influence appetite and eating behavior but also seem to act positively on depressive symptoms (Aoun *et al.* 2024, Balantekin *et al.* 2024, Chen *et al.* 2024). However, AOMs should be part of a comprehensive treatment plan, including psychological support, to prevent misuse.

Finally, hormonal, genetic, and metabolic factors offer promising targets for future treatments (Vosburg *et al.* 2022). For example, adverse mental health effects such as depression and suicide, observed in some patients after MBS, may be related to changes in gut-derived hormones, microbial profiles, and bile acid compositions. These alterations might disrupt gut-brain signaling pathways, affecting neurotransmitter regulation and other mood-related molecules (Wadden *et al.* 2023, Wang *et al.* 2023). This underscores the need for further research into the connections between gut health, brain function, and mental health, particularly regarding the physiological changes induced by MBS.

3.3. Limitations:

The limitations of each original contribution are discussed in the full-text versions of the respective manuscript.

This thesis demonstrates that short preoperative education and lifestyle programs could serve as a useful tool in preoperative preparation for certain subgroups. However, the amount of weight loss achieved preoperatively was minimal, and no significant effect on long-term weight loss was observed post-surgery. In terms of mental health, preoperative lifestyle programs can provide short-term stabilization or improvement in participants' mental health, but these benefits also tended to diminish over time (David *et al.* 2020, Gade *et al.* 2015, Hjelmesæth *et al.* 2019, Lodewijks *et al.* 2022, Paul *et al.* 2021). Even intensive preoperative CBT, designed to address mental health issues related to obesity, has shown limited long-term efficacy (David *et al.* 2020, Gade *et al.* 2015, Hjelmesæth *et al.* 2019). Research aligns with our findings, suggesting that extending the study period beyond the typical one-year timeframe would likely not reveal substantial differences in outcomes (Paul *et al.* 2022, Paul *et al.* 2021). Like already mentioned, one reason could be that MBS itself is a powerful intervention, and preoperative weight loss achievements may not significantly influence long-term outcomes (Deutsche Gesellschaft für Allgemein- und Viszeralchirurgie 2018, Heshka *et al.* 2020, Lau *et al.* 2023, Mirahmadian *et al.* 2018).

Moreover, the effectiveness of preoperative lifestyle programs depends on accurately identifying subgroups most likely to benefit. While some risk factors for unsuccessful weight loss or weight regain are known, research has not yet effectively delineated which patients are at greatest risk and how to identify them preoperatively (El Ansari *et al.* 2021, Noria *et al.* 2023). Although behavior changes and mental health are considered important factors for successful postoperative outcomes (Brazil *et al.* 2021, Murphy *et al.* 2024), their impact on long-term weight loss might be overestimated. Lifestyle programs alone are often insufficient to achieve the necessary long-term behavioral changes required for sustained success (Cohen *et al.* 2023, El Ansari *et al.* 2021, Noria *et al.* 2023).

Additionally, despite the effectiveness of MBS, metabolic and physiological adaptations - such as decreased resting metabolic rate, changes in appetite-regulating hormones, and increased hunger - may contribute to weight regain after MBS more significantly than previously understood. These physiological changes could counteract the benefits of lifestyle interventions, leading to weight regain over time (Breuing *et al.* 2022, Heshka *et al.* 2020).

While this thesis offers valuable insights into potential improvements in MBS preoperative care, it is primarily based on two studies and on data solely from the VIADUKT program, which represents only one approach to preoperative care. Consequently, these findings may not fully capture the diverse range of experiences and outcomes among MBS patients. Given the limited scope, the conclusions drawn here are preliminary and not sufficient to substantiate definitive claims or can be generalized regarding the impact of preoperative interventions, although they align with existing research. Therefore, this thesis does not aim to propose concrete changes to preoperative protocols but rather highlights areas for future research and refinement in MBS preoperative care.

3.4. Conclusions

There is a significant knowledge and care gap in the preoperative preparation for metabolic and bariatric surgery, particularly regarding the optimization of risk factors, such as mental health and behavioral issues, which influence long-term weight loss outcomes.

The preoperative VIADUKT II program, designed to educate and support patients, successfully stabilized both weight and mental health prior to MBS. The program's implementation in preoperative preparation could especially be beneficial for specific subgroups, such as individuals with mental health challenges and those who need to fulfill conservative requirements before MBS. However, it remains unclear why some patients within these subgroups did not experience improvements. This raises concerns about whether these individuals are at higher risk for unsuccessful outcomes post-surgery.

The fact that online delivery of the intervention was as effective as in-person sessions presents an opportunity to improve access to care by eliminating barriers such as travel time and geographic limitations. This flexibility could make preoperative preparation more accessible to a broader range of patients. Moreover, the increased risk of severe COVID-19 outcomes for individuals with obesity highlights the urgent need to optimize obesity treatment strategies to mitigate such risks.

In addition, new anti-obesity medications are playing an increasingly important role in obesity management, offering an alternative or complementary approach to MBS and potentially enhancing surgical outcomes when integrated with existing treatment strategies. The evolving landscape of obesity management suggests a shift in research priorities, with a need to explore how AOMs can be effectively combined with MBS to provide a more comprehensive, individualized approach to care.

The emergence of new treatment options, combined with the effectiveness of online interventions, indicates that the future of obesity management may lie in a more personalized, accessible, and multi-modal approach. This will not only help address the gaps in preoperative care but also improve long-term outcomes for patients undergoing MBS.

4. Summary

Obesity is a chronic disease characterized by excessive body fat, which negatively impacts health and increases the risk of obesity-related conditions like type 2 diabetes. It is typically assessed using BMI, with a BMI of 30 or higher indicating obesity, further categorized into three classes. The global prevalence of obesity has risen dramatically in recent decades, posing significant health challenges and an economic burden on society.

Obesity results from a combination of biological, genetic, epigenetic, and social factors, but is primarily driven by modern lifestyle factors such as increased energy intake and lack of physical activity. It significantly affects physical health, contributing to cardiovascular disease and joint degeneration, and has psychological consequences, including mental health issues like depression, eating disorders, and discrimination.

Obesity treatment aims to reduce weight, improve associated comorbidities, and enhance quality of life through conservative, pharmacological, and surgical options. While conservative treatment focuses on changes in diet, behavior, and physical activity, new anti-obesity medications mimicking gastrointestinal hormones have shown promise for weight loss. However, metabolic and bariatric surgery remains the most effective treatment for substantial, long-term weight loss, with added mental health benefits. MBS is typically recommended for individuals with a BMI ≥ 40 kg/m² or a BMI ≥ 35 kg/m² with obesity-related conditions, provided that conservative treatments have failed. However, some patients experience weight regain and a recurrence or new onset of mental health issues post-surgery.

Preoperative psychological and behavioral factors can affect postoperative outcomes, but mental health and behavior have received little attention in preoperative preparation. Addressing these factors may be key to improving MBS success. A comprehensive preoperative evaluation, including psychological assessment, is recommended. While health insurers often mandate preoperative weight loss, research shows that such requirements do not improve postoperative outcomes. Instead, preoperative lifestyle and educational programs focused on educating patients about obesity, MBS, risks, and necessary lifestyle changes may have greater benefits.

This thesis explores the effects of preoperative educational and lifestyle programs on mental health, patient satisfaction, and weight loss. First, a systematic review examined the impact of these programs on postoperative weight loss. Second, the VIADUKT II program, a university-based preoperative lifestyle and educational intervention, was analyzed for its effects on weight loss, psychological benefits, patient satisfaction, and different delivery modes in the preoperative period.

The study "Effects of Lifestyle and Educational Bridging Programs before Bariatric Surgery on Postoperative Weight Loss" (Lau *et al.*, Obesity Facts, 2023) found that preoperative lifestyle interventions were more effective at reducing BMI before MBS compared to usual care. However, one-year post-surgery, no significant difference in weight loss was observed between the groups, and preoperative weight loss did not influence long-term outcomes.

A second publication analyzed VIADUKT II data to investigate the psychological effects of a preoperative educational program and the effectiveness of online delivery via videoconferencing. The study "Psychological Benefits of a Preoperative Educational Bridging Program for Bariatric Surgery: Does Face-to-Face versus Videoconference-Based Delivery Make a Difference?" (Lau *et al.,* Obesity Facts, 2024) found that short educational programs significantly improved depression, anxiety, and stress before MBS. Online delivery was equally effective as face-to-face classes.

In conclusion, while preoperative lifestyle and education programs contribute to short-term weight loss, they have limited impact on postoperative weight loss. However, these programs have significant value in improving patients' mental health before MBS. Online programs are as effective as in-person sessions, highlighting the potential for flexible delivery methods. Further research is needed to identify subgroups that could benefit most from these interventions and explore future treatment options, especially with the emergence of new anti-obesity medications.

5. Zusammenfassung

Adipositas ist eine chronische Erkrankung, die durch eine übermäßige Ansammlung von Körperfett gekennzeichnet ist und mit einem erhöhten Risiko für zahlreiche Folgeerkrankungen, darunter Diabetes Typ II, einhergeht. Die Diagnose basiert auf dem Body-Mass-Index, wobei ein BMI von ≥30 kg/m² als Adipositas definiert wird. Diese wird in drei Schweregrade (Grad I–III) eingeteilt.

In den vergangenen Jahrzehnten ist die Prävalenz von Adipositas weltweit stark angestiegen, was nicht nur erhebliche gesundheitliche Konsequenzen nach sich zieht, sondern auch zu einer signifikanten sozioökonomischen Belastung führt. Die Ätiologie der Adipositas ist multifaktoriell und umfasst genetische, epigenetische, biologische sowie soziale Faktoren. Dennoch wird die Zunahme der Prävalenz vorwiegend auf den modernen Lebensstils zurückgeführt, der insbesondere durch eine gesteigerte Kalorienaufnahme bei gleichzeitigem Bewegungsmangel gekennzeichnet ist.

Die gesundheitlichen Folgen von Adipositas sind weitreichend und umfassen unter anderem kardiovaskuläre Erkrankungen, degenerative Gelenkerkrankungen sowie metabolische Störungen. Darüber hinaus sind auch psychische Belastungen wie Depressionen, Essstörungen und soziale Diskriminierung häufige Komorbiditäten der Adipositas.

Die Therapie der Adipositas zielt auf eine nachhaltige Gewichtsreduktion, die Verbesserung Adipositas-assoziierter Komorbiditäten sowie eine Verbesserung der Lebensqualität ab, die Therapie wird in konservative, pharmakologische und chirurgische Ansätze gegliedert. Konservative Therapieformen beinhalten eine Kombination aus Ernährungsumstellung, Verhaltenstherapie und gesteigerter körperlicher Aktivität. Während diese Maßnahmen insbesondere bei leichter bis mittelschwerer Adipositas wirksam sein können, zeigen neuere pharmakologische Ansätze, wie beispielsweise Medikamente, die gastrointestinale Hormone imitieren (z. B. GLP-1-Agonisten), vielversprechende Ergebnisse bei der Gewichtsreduktion.

Für Patienten, bei denen konservative und pharmakologische Maßnahmen unzureichend sind, stellt die metabolische und bariatrische Chirurgie die effektivste Methode für eine langfristige und signifikante Gewichtsreduktion dar. Zudem sind positive Effekte der MBS auf Adipositas-assoziierte Komorbiditäten und die psychische Gesundheit gut belegt. Bariatrische Eingriffe werden in der Regel bei Patienten mit einem BMI ≥40 kg/m² oder bei einem BMI ≥35 kg/m² in Kombination mit Begleiterkrankungen empfohlen, sofern konservative Therapieversuche über mindestens sechs Monate erfolglos geblieben sind.

Trotz der hohen Wirksamkeit von MBS treten jedoch postoperative Herausforderungen auf. Dazu zählen eine erneute Gewichtszunahme bei einem Teil der Patienten sowie die Verschlechterung oder das Auftreten psychischer Erkrankungen. Dies unterstreicht die Notwendigkeit einer langfristigen Nachsorge und multidisziplinären Betreuung.

Psychische und verhaltensbezogene Faktoren, die bereits vor einem bariatrischen Eingriff bestehen, können das postoperative Ergebnis signifikant beeinflussen. Dennoch wurde diesen Risikofaktoren in der präoperativen Vorbereitung bislang wenig Aufmerksamkeit geschenkt. Es wird angenommen, dass eine systematische Berücksichtigung dieser Faktoren dazu beitragen könnte, den langfristigen Erfolg metabolischer und bariatrischer Eingriffe zu fördern. Eine umfassende präoperative Evaluation, einschließlich einer psychologischen Beurteilung, wird bereits in den Leitlinien empfohlen. Zudem fordern Krankenkassen in vielen Fällen einen präoperativen Gewichtsverlust in Form eines bestimmten prozentualen Anteils des Ausgangsgewichts. Studien zeigen jedoch, dass solche Vorgaben die postoperative Gewichtsabnahme nicht signifikant beeinflussen.

Im Gegensatz dazu könnten präoperative Programme, die Lebensstiländerungen, Aufklärung über Adipositas, Mechanismen des operativen Eingriffs sowie damit verbundene Risiken und postoperativ erforderliche Verhaltensänderungen umfassen, zum Erfolg der metabolischen und bariatrischen Chirurgie beitragen.

Diese Arbeit untersucht die Auswirkungen präoperativer Schulungs- und Lebensstilinterventionen auf den Gewichtsverlust, die psychische Gesundheit und die Zufriedenheit der Teilnehmer. Im ersten Schritt wurde mittels eines systematischen Reviews der Einfluss dieser Programme auf den postoperativen Gewichtsverlust analysiert. Darauf aufbauend wurde VIADUKT II, eine präoperatives Schulungsprogramm, das an der Universitätsklinik Tübingen durchgeführt wurde, hinsichtlich der Effekte auf den Gewichtsverlust, die psychische Gesundheit und die Patientenzufriedenheit evaluiert. Zusätzlich wurden die beiden Implementierungsformen – „Präsenz“ und „Online via Videokonferenz“ – hinsichtlich ihrer Wirksamkeit verglichen.

Die systematische Übersichtsarbeit „Effects of Lifestyle and Educational Bridging Programs before Bariatric Surgery on Postoperative Weight Loss" (Lau et al., Obesity Facts, 2023) zeigte, dass präoperative Lebensstilinterventionen im Vergleich zur Standardversorgung effektiver bei der Reduzierung des BMI vor einer bariatrischen Operation waren. Ein Jahr nach dem Eingriff konnte jedoch kein signifikanter Unterschied im postoperativen Gewichtsverlust zwischen den Interventionsgruppen und der Standardversorgung festgestellt werden. Zudem zeigte ein erfolgreicher präoperativer Gewichtsverlust keinen positiven Einfluss auf die postoperative Gewichtsentwicklung.

Die zweite Arbeit analysierte die Daten des VIADUKT II Programms, um die psychologischen Auswirkungen eines präoperativen edukativen Programms sowie die Wirksamkeit der Online-Durchführung via Videokonferenz zu evaluieren. Die Ergebnisse der Studie ”Psychological Benefits of a Preoperative Educational Bridging Program for Bariatric Surgery: Does Face-to-Face versus Videoconference-Based Delivery Make a Difference?" (Lau et al., Obesity Facts, 2024) zeigten, dass kurze edukative Interventionen vor bariatrischen Eingriffen die Symptome von Depressionen, Angstzuständen und Stress signifikant verbessern konnten. Die Online-Durchführung mittels Videokonferenz, verurdacht durch die Covid-19 Pandemie, war ebenso wirksam wie die Intervention in Präsenz.

Zusammenfassend lässt sich schlussfolgern, dass präoperative edukative Lebensstilprogramme zwar zu einem kurzfristigen Gewichtsverlust in der präoperativen Phase führen, jedoch keinen signifikanten Einfluss auf den postoperativen Gewichtsverlust zeigen. Dennoch haben diese Programme Vorteile hinsichtlich der Verbesserung der psychischen Gesundheit der Patienten vor einer bariatrischen Operation aufgezeigt.

Die Ergebnisse zeigen zudem, dass die Online-Durchführung solcher Programme ebenso wirksam ist wie die von Präsenzveranstaltungen, was das Potenzial für flexible und ortsunabhängige Implementierungsformen unterstreicht.

Künftige Forschung sollte darauf abzielen, spezifische Risikogruppen zu identifizieren, die besonders von diesen präoperativen Interventionen profitieren könnten. Darüber hinaus wäre weitere Forschung hilfreich, um zukünftige Behandlungsstrategien zu entwickeln, insbesondere angesichts des Aufkommens der neuen Medikamente gegen Adipositas, insbesondere im Hinblick auf deren langfristige Effektivität und Anwendbarkeit, sowie um das Zusammenspiel von präoperativen Programmen und medikamentösen Therapien für Adipositas zu verstehen und besser nutzen zu können.

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