**Review**

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# Relationship Between Preoperative Cognitive Functions and Bariatric Surgery Outcomes: A Scoping Review

## Preoperatif Bilişsel İşlevler ile Bariatrik Cerrahi Sonuçları Arasındaki İlişki: Kapsam Derlemesi

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## ABSTRACT

Bariatric surgery is recognized as one of the most effective interventions in the treatment of obesity. Its success depends not only on weight loss and related biological factors, but also on psychological and cognitive aspects. This scoping review aims to systematically review empirical studies that examine the role of cognitive functions and processes assessed before surgery in predicting bariatric surgery outcomes. A comprehensive literature search was carried out using the Web of Science, Scopus, and PubMed databases. In total, 11 studies that satisfied the established inclusion and exclusion criteria were selected for analysis. The review was performed following the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews) guidelines. Analyses were structured using the population, concept, and context framework. Findings were organized under three main themes. First, individuals with lower performance in attention, memory, and executive functions tended to lose less weight after surgery, though this relationship was not consistently observed across all studies. Second, reduced cognitive functioning before surgery was associated with lower adherence to treatment-related behaviors such as attending medical appointments, maintaining dietary routines, and engaging in physical activity. Third, individuals with cognitive risk profiles, including symptoms of attention deficit hyperactivity disorder or high impulsivity, were more likely to experience complications such as substance use, disordered eating, and psychosocial difficulties postoperatively. These findings suggest that preoperative cognitive functioning may influence not only physical outcomes but also behavioral and psychosocial adaptation following surgery.

**Keywords:** Bariatric surgery, cognitive functions, obesity surgery, executive functions

## ÖZ

Bariatrik cerrahi, obezite tedavisinde en etkili müdahalelerden biri olarak kabul edilmektedir. Cerrahinin başarısı sadece kilo kaybı ve ilişkili biyolojik faktörlere değil, aynı zamanda psikolojik ve bilişsel etmenlere de bağlıdır. Bu kapsam derlemesi, bariatrik cerrahi sonuçlarında preoperatif bilişsel işlevlerin ve süreçlerin rolünü inceleyen ampirik literatürü sistematik biçimde derleyerek literature katkı sunmayı amaçlamaktadır. Web of Science, Scopus ve PubMed veri tabanlarında yürütülen sistematik tarama sonucunda, belirlenen dahil etme ve dışlama ölçütlerine göre 11 çalışma bu derlemenin kapsamına dahil edilmiştir. Taramalar PRISMA-ScR yönergeleri temel alınarak gerçekleştirilmiş ve analizler popülasyon, kavramsal odak ve bağlama göre yapılandırılmıştır. Bulgular üç ana tema altında sunulmuştur: (1) Dikkat, bellek ve yürütücü işlevlerde düşük performans gösteren bireylerde kilo kaybı düzeylerinin daha düşük olduğu ancak bu ilişkinin tüm çalışmalarda tutarlı olmadığı görülmüştür. (2) Tedaviye uyum davranışlarındaki (randevuya katılım, diyet takibi, fiziksel aktivite) azalma ile bilişsel işlevlerdeki zayıflıkların ilişkili olduğu anlaşılmaktadır. (3) Dikkat eksikliği ve hiperaktivite bozukluğu veya yüksek dürtüsellik gibi bilişsel risk profillerine sahip bireylerde cerrahi sonrası dönemde madde kullanımı, yeme bozukluğu davranışları ve komplikasyon riskinde artış rapor edilmiştir. Bu bulgular, preoperatif bilişsel işlevlerin bariatrik cerrahi sonrası yalnızca fiziksel değil, davranışsal ve psikososyal uyum açısından da etkili olabileceğini göstermektedir.

**Anahtar sözcükler:** Bariatrik cerrahi, bilişsel işlevler, obezite cerrahisi, yürütücü işlevler

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## Introduction

Obesity has been addressed as a priority global public health issue in recent years due to its rapidly increasing prevalence worldwide, its complex etiology, and its multidimensional health consequences. In the literature, obesity is emphasized to be associated not only with chronic physical conditions such as diabetes, cardiovascular disease, and types of cancer (Haslam & James 2005), but also with psychological, social, and behavioral difficulties that negatively affect an individual's quality of life (Simon et al. 2006). Among these difficulties are factors such as low self-esteem, body image dissatisfaction, depressive symptoms, social isolation, experiences of stigmatization, emotional eating, and insufficient physical activity. Bariatric surgery (BS), one of the major interventions that provides long-term success in the management of obesity, is associated not only with significant weight loss and reduction in comorbidities but also with various behavioral and neurocognitive outcomes (Sjöström et al. 2007, Alosco et al. 2014). In recent years, the potential effects of BS on individuals' cognitive processes and how these effects are reflected in surgical outcomes have been increasingly addressed in the literature.

It has been suggested that systemic inflammation associated with obesity may trigger neuroinflammatory processes in the brain, leading to disruptive effects on attention, memory, and executive functions; and that recovery in cognitive functions may be possible after BS through the reduction of these inflammatory responses (Miller & Spencer 2014). Furthermore, metabolic changes such as decreased insulin resistance and improved glucose metabolism following surgery are reported to enhance the functionality of hippocampal structures, thereby contributing to improvements in memory and executive functions (Gunstad et al. 2011). In addition, the marked reduction in the severity of sleep apnea following BS supports indirect improvements in cognitive performance by both increasing overall brain oxygenation and enhancing sleep quality (Peromaa-Haavisto et al. 2024).

Investigating the relationship between BS and cognitive functions such as attention, executive functions, memory, and processing speed demonstrates that obesity should be considered not only in terms of its metabolic aspects but also from a neuropsychological perspective as a multidimensional condition. Cognitive functions are mental processes that enable individuals to perceive and process environmental information and to develop appropriate behaviors. These processes include executive functions such as attention, planning, decision-making, problem-solving, response inhibition, and working memory (Diamond 2013). The literature reports that cognitive difficulties such as impairments in executive functions, poored attentional control, memory deficits, and slowed mental processing speed are commonly observed among individuals with obesity (Gunstad et al. 2007, Smith et al. 2011). Executive functions have been shown in numerous neuropsychological and neuroimaging studies to be associated primarily with frontal lobe structures, particularly the dorsolateral prefrontal cortex; attention processes with the prefrontal and parietal cortices; and memory functions with the medial temporal lobe and the hippocampus (Squire & Zola-Morgan 1991, Cabeza & Nyberg 2000, Alvarez & Emory 2006).

Studies (Nederkoorn et al. 2006, Mobbs et al. 2010) have demonstrated that these impairments are not limited to information processing and execution processes but also include cognitive–motivational responses to environmental stimuli such as response control, impulsive tendencies, reward sensitivity, and behavioral decision-making. Research indicates that individuals with obesity exhibit deficits particularly in areas such as response inhibition, delay of gratification, and planning skills; and that this condition may reduce control over eating behavior, thereby creating a risk factor in the postoperative period as well (Nederkoorn et al. 2006, Mobbs et al. 2010). Neuroimaging studies provide important clues in understanding the mechanisms underlying these cognitive impairments. Individuals with obesity have been found to exhibit increased activation in striatal regions in response to rewarding stimuli such as food, along with decreased activation in areas responsible for executive functions, such as the dorsolateral prefrontal cortex (Volkow et al. 2013). This imbalance may sustain overeating behaviors by the simultaneous presence of increased reward sensitivity and weakened cognitive control mechanisms.

Studies systematically examining changes in various cognitive functions such as attention, working memory, planning, response inhibition, and processing speed following BS have gained increasing attention in recent years. One of the first comprehensive systematic reviews in the field, conducted by

Handley and colleagues (2016), examined 18 studies and revealed that significant postoperative cognitive improvements, particularly in the domains of memory, executive functions, and attention, were frequently reported. The authors noted that these improvements cannot be explained solely by weight loss; physiological mechanisms such as hormonal changes, reductions in inflammation, increases in neuroplasticity, and improvements in glucose metabolism may also be influential. It was also emphasized that cognitive gains are mostly observed within the first 12 months following surgery, but sufficient data regarding long-term effects are lacking (Handley et al. 2016). These early findings provided a framework for future studies.

The subsequent systematic review conducted by Thiara and colleagues (2017) examined 10 studies focusing on cognitive changes after BS. In all of the studies reviewed, significant improvements were reported in at least one cognitive domain postoperatively, with particular emphasis on positive changes in memory and executive functions (Thiara et al. 2017). The authors supported the views of Handley and colleagues (2016) by highlighting that these improvements cannot be explained solely by weight loss. However, they also pointed out that the small sample sizes, limited follow-up periods, and the diversity of cognitive assessment tools used restricted the generalizability of the findings. This indicates a need for larger-scale and methodologically comprehensive studies in the field.

A more recent and broader framework on the subject was presented by Hathaway and colleagues (2024), who systematically evaluated 13 studies focusing on cognitive changes following BS. Most of the review findings indicated significant improvements, particularly in memory and executive functions (Hathaway et al. 2024). However, some studies reported improvements only in limited domains (attention span, verbal fluency, processing speed), while in some samples no cognitive improvements were reported (Hathaway et al. 2024). The authors explained these differences in findings by sample diversity, timing of assessments, and variations in measurement tools. In addition, the positive outcomes reported in some studies with short follow-up periods were associated with the effect of postoperative optimism—defined in the literature as a "honeymoon period," in which individuals temporarily respond more positively to the new lifestyle following surgery.

These three systematic reviews (Handley et al. 2016, Thiara et al. 2017, Hathaway et al. 2024) indicate that BS may have positive effects on individuals' cognitive functions such as attention, memory, and executive functions. However, current findings reveal that these improvements are not observed in all individuals and are often limited to basic attentional processes. Furthermore, considering that such cognitive gains are mostly temporary in nature and that the primary purpose of BS is not to improve cognitive functions, these gains can be considered as secondary benefits. On the other hand, all three review studies focused on the postoperative period and did not systematically examine the potential role of preoperative cognitive profiles in surgical processes and outcomes.

In the literature, attention-deficit/hyperactivity disorder (ADHD)—characterized by cognitive deficits such as inattention and impulsivity—stands out as a significant neurodevelopmental disorder frequently encountered among BS candidates and one that may complicate treatment adherence (Altfas 2002). The association of ADHD with difficulties in executive function domains (e.g., attention, inhibitory control, planning), heightened reward sensitivity, and impulsivity requires that this disorder be considered as a potential cognitive risk factor influencing surgical outcomes. The systematic review by Schag and colleagues (2013) revealed that impulsivity is a key risk factor in difficulties regulating eating behaviors among individuals with obesity; and emphasized that this trait is more strongly associated with binge eating and impairments in eating control. The study also indicated that impulsivity is not merely a behavioral tendency but is also associated with difficulties in executive function domains such as increased sensitivity to rewarding stimuli like food and weakened inhibitory control; and that these difficulties may trigger overeating behaviors through increased attentional bias toward food cues and impairments in control processes. Thus, executive functions may serve as a critical mediating mechanism in the relationship between impulsivity and eating behaviors.

In the literature, BS has been reported to provide potential benefits not only in disorders related to attentional processes such as ADHD and impulsivity but also in other cognitive disorders such as mild

cognitive impairment (MCI) and dementia. Chen and colleagues (2025) reported that BS not only reduced the risk of developing MCI and dementias associated with Alzheimer's disease but also delayed the onset of MCI by an average of two years. In this retrospective cohort study, individuals who underwent surgery had a 63% reduced risk of Alzheimer's disease and related dementias, while the risk of MCI decreased by 43%. Such robust longitudinal findings support the view that BS may play a protective role in cognitive disorders beyond ADHD and suggest that preoperative cognitive assessments should consider not only executive processes but also the risk of mild cognitive impairment.

A comprehensive review systematically addressing the relationship between preoperative cognitive functions (e.g., attention, memory, executive functions, response inhibition) and BS outcomes has not yet been included in the literature. This scoping review aims to systematically present studies examining the relationship between preoperative cognitive processes such as executive functions, attention, response control, and decision-making, and postoperative outcomes such as weight loss and treatment adherence. This study fills an important gap in the literature and provides valuable clinical insights into how preoperative cognitive assessments can be used to identify potential areas of difficulty and cognitive/psychological vulnerabilities in surgical candidates. In this context, the main research question of the study can be defined as follows: How do preoperative cognitive functions and processes play a role in the postoperative course of bariatric surgery?

# Method

## Research Design

This study was conducted as a scoping review in order to identify gaps in the literature and to contribute to the planning and design of future research. Accordingly, the study process was structured based on the methodological framework recommended by the Joanna Briggs Institute (JBI), and the reporting stage was carried out in accordance with the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews) guidelines (Tricco et al. 2018, Peters et al. 2020).

## Inclusion and Exclusion Criteria

The study selection process in this scoping review was conducted in line with the Population–Concept–Context (PCC) framework recommended by the Joanna Briggs Institute (JBI) and widely used in scoping reviews. Within the population component, the target group of the study consisted of adults aged 18 years and older who had undergone or were candidates for BS. In accordance with the concept component, studies were required to address the relationship between BS outcomes and core cognitive processes such as executive functions, attention, and memory, as well as behavioral–cognitive traits such as impulsivity. Within the context component, studies were expected to address the BS process and include cognitive assessments related to this process. Accordingly, studies that did not include an adult population, did not present direct data on cognitive functions, or focused only on lifestyle changes, biomedical indicators, or surgical techniques were excluded.

In the inclusion process, certain methodological and publication criteria were also taken into consideration. Only original research articles published between 2006 and 2025, written in English or Turkish (or translated into these languages), and presenting empirical data were included. The inclusion and exclusion criteria are presented in Table 1

## Information Sources and Search Strategy

For this scoping review, a literature search was conducted in March 2025 using the PubMed, Scopus, and Web of Science (WoS) databases. During the search, a systematic keyword strategy was developed to identify studies examining the relationship between BS and cognitive functions. In each database, terms related to bariatric surgery ("bariatric surgery," "obesity surgery," "weight loss surgery," etc.) were

combined with terms related to cognitive functions ("cognitive function," "executive function," "attention," "memory," "impulsivity," etc.) using Boolean operators (AND, OR) (see Appendix 1).

**Table 1. Inclusion and exclusion criteria**

| Criterion Type | Inclusion | Exclusion |
|---|---|---|
| Population | Studies including adults (≥18 years) who have undergone or are candidates for bariatric surgery | Studies focusing exclusively on children, adolescents, or elderly populations |
| Concept | Studies addressing cognitive functions (e.g., executive functions, impulsivity) | Studies focusing solely on biological indicators, surgical techniques, or general lifestyle changes |
| Context | Studies involving bariatric surgery (post-op or pre-op, post-op) | Studies focusing only on non-surgical interventions such as diet, exercise, or pharmacological treatment |
| Time period | Studies published between 2006–2025 | Studies published before 2006 |
| Language | Studies written in or translated into English or Turkish | Studies published in languages other than English or Turkish without available translation |
| Publication type | Empirical research articles presenting qualitative, quantitative, or mixed-methods data | Systematic reviews, case reports, theses, book chapters, conference proceedings, editorials, opinion pieces |

### Study Selection Process

The study selection process in this scoping review was carried out systematically and through multiple stages. As a result of the literature search, a total of 2883 records were retrieved from the three databases. The records obtained from the databases were merged using the EndNote reference management software, and duplicates were identified and removed. After removing duplicates, 2427 unique studies were screened at the title and abstract level. At this stage, 2413 studies were excluded, and 14 full-text articles were assessed in detail. In the full-text review phase, the compatibility of the studies with the aim of the current scoping review and the inclusion–exclusion criteria was evaluated comprehensively. As a result of the full-text assessment, 3 studies were excluded, and 1 additional study was identified through backward and forward citation searches. Since this study did not fully meet the conceptual focus of the review, it was not included. The entire review process was conducted by two independent researchers, and in cases where consensus could not be reached, the opinion of a third expert was sought. Ultimately, a total of 11 studies were included in the scoping review. Detailed information on the literature search and selection process is presented in the PRISMA-ScR Flow Diagram (Figure 1).

## Results

### General Characteristics of the Studies

A total of 11 original studies were included in this scoping review. According to the search conducted from 2006 onwards, the included studies were published between 2013 and 2023. All of the included studies were conducted using quantitative methods. Sample sizes ranged from 35 to 4293, with participant profiles consisting predominantly of women. Measurement times generally covered both preoperative and postoperative periods (3, 6, 12, and 24 months). Since no postoperative follow-up measurement was conducted in 3 of the 11 included studies, only the follow-up periods of 8 studies are indicated in the table. The studies included in the review were conducted primarily in the United States, as well as in European countries (e.g., Germany, Norway, Sweden). The most frequently applied surgical method was Roux-en-Y gastric bypass (n = 8), followed by sleeve gastrectomy (n = 5) and other methods such as gastric banding (n = 3). The general characteristics of the included studies are presented in Table 2.

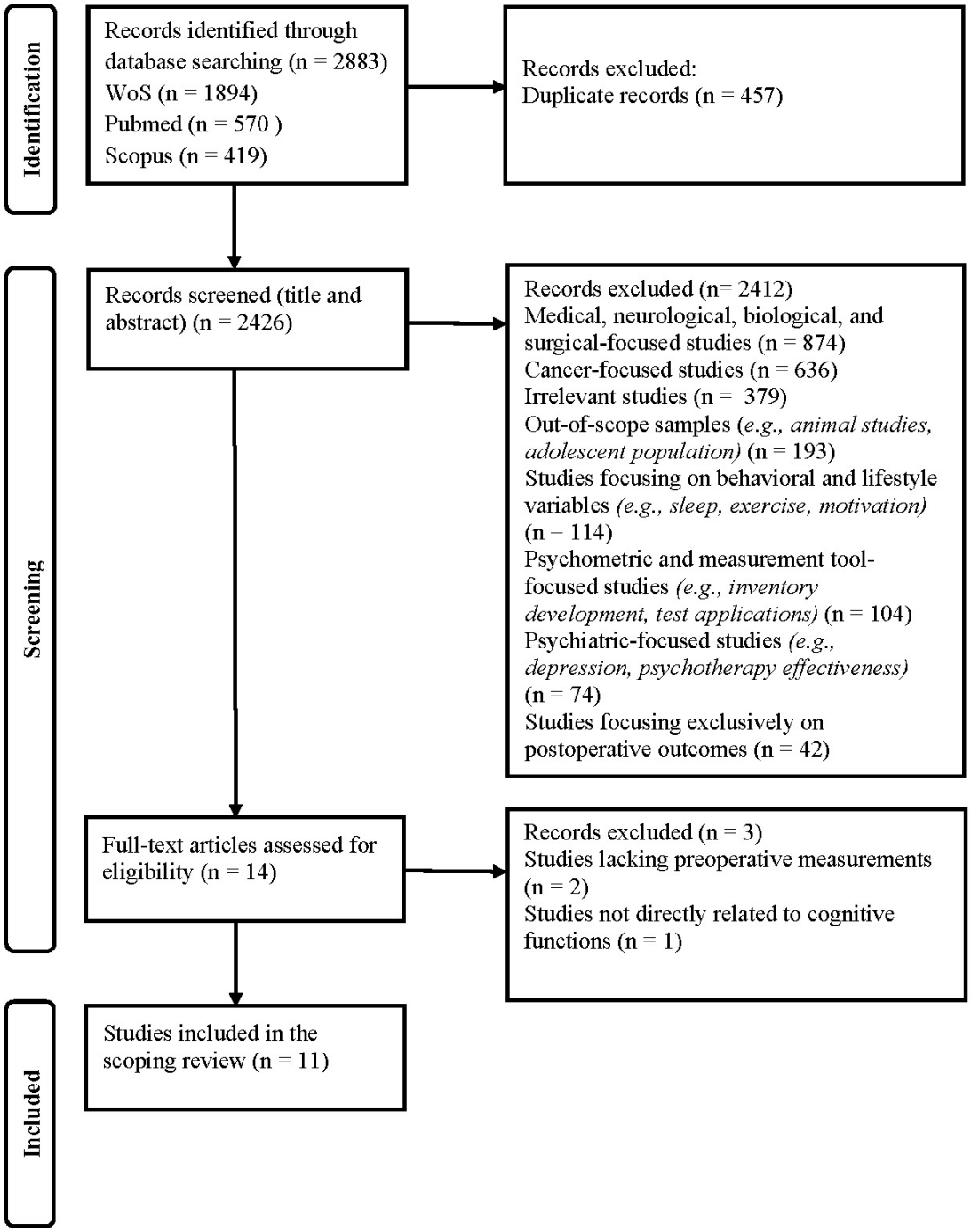


**Figure 1. PRISMA flow diagram**

The cognitive assessment tools used in the studies included in this review are classified according to the functional domains they measure and are presented in Table 3. In the majority of the included studies, performance-based tests evaluating executive functions and attentional processes were used; whereas assessments of memory and, in particular, impulsivity remained more limited.

The findings of the original studies included in this review were organized under three thematic headings according to the relevant outcomes, in order to clarify the relationship between preoperative cognitive functions and surgical outcomes: (1) preoperative cognitive functions and weight loss outcomes, (2) cognitive functions and treatment adherence, (3) cognitive risk profiles and psychosocial outcomes. A summary of the studies is presented in Table 4.

| Table 2. Descriptive characteristics of the included studies (N= 11) | | |
|---|---|---|
| **Characteristics** | **n** | **%** |
| Year | | |
| 2013–2017 | 6 | 54.5 |
| 2018–2021 | 2 | 18.2 |
| 2022–2023 | 3 | 27.3 |
| Sample Size Range | | |
| 0–100 | 8 | 72.7 |
| 101–250 | 2 | 18.2 |
| 501+ | 1 | 9.1 |
| Research Design | | |
| Prospective | 5 | 45.5 |
| Cross-sectional | 4 | 36.4 |
| Retrospective | 2 | 18.2 |
| Assessment Time Point(s) | | |
| Only post-op | 5 | 45.5 |
| Pre-op & post-op | 6 | 54.5 |
| Follow-up Duration | | |
| 1–6 months | 2 | 25.0 |
| 12–24 months | 4 | 50.0 |
| ≥ 4 years | 2 | 25.0 |

| Table 3. Cognitive tests | | |
|---|---|---|
| **Test / Scale Name** | **Test Type** | **Frequency** |
| Executive Functions and Attention | | |
| Attention Shifting Test (SoA) | Performance | 1 |
| Stop-Signal Task (SST) | Performance | 2 |
| Stop-Signal Reaction Time (SSRT) | Performance | 2 |
| Letter–Number Sequencing Test (LNS) | Performance | 1 |
| Trail Making Test (TMT) | Performance | 1 |
| Maze Task (MT) | Performance | 2 |
| Color–Word Interference Test (CWIT) | Performance | 1 |
| Digit Span Test (DS) | Performance | 1 |
| Choice Reaction Time Test (CRTT) | Performance | 1 |
| Symbol Digit Modalities Test (SDMT) | Performance | 1 |
| Verbal Interference Test (VIT) | Performance | 1 |
| Stroop Test | Performance | 1 |
| One-Touch Stockings Test (OTS) | Performance | 1 |
| Memory | | |
| Hopkins Verbal Learning Test (HVLT) | Performance | 1 |
| Spatial Working Memory Test (SWM) | Performance | 1 |
| Verbal Learning Test (VLT) | Performance | 2 |
| Impulsivity | | |
| Barratt Impulsiveness Scale (BIS 11-15) | Self-report | 2 |
| Temporal Delay Discounting Task (TDT) | Performance | 1 |
| General Cognitive Function and Decision-Making | Performance | |
| Iowa Gambling Task (IGT) | Performance | 1 |
| Montreal Cognitive Assessment (MOCA) | Performance | 1 |

**Table 4. Overview of included studies ( N=11)**

| Reference | Objective | Study Design | Participants | Outcome Measures | Key Findings |
|---|---|---|---|---|---|
| Marchesi et al. (2017) | To examine the effect of ADHD diagnosis on BS outcomes | Retrospective observational (patients who had undergone surgery within the past 12 months and regularly attended follow-up appointments) | N= 40<br>15 ADHD +<br>93% female | · %EBMIL (12 ay)<br>· ΔBMI (3,6,12. ay)<br>· Success rate (%EWL>50) | Weight Loss:<br>· ADHD ⟹ ΔBMI ↓ (at 6 months)<br>· ADHD ⊥ ΔBMI (at 12 months)<br>· ADHD ⊥ %EBMIL<br>· ADHD ⊥ %EWL >50 (surgical success)<br>Psychosocial Outcomes:<br>·ADHD ⊥ number of comorbidities |
| Nicolau et al. (2015) | To compare the clinical, biological, and psychological outcomes of individuals meeting ADHD criteria after BS | Cross-sectional case–control (X= 46 months) | N= 60<br>19 ADHD +<br>78% female | · BMI<br>· Follow-up compliance<br>· Lipid profile<br>· Eating pattern<br>· Binge eating (QEWP-R-S)<br>· Depressive symptoms (BDI)<br>· Health-related quality of life (SF-36) | Weight Loss:<br>· ADHD ≅ ΔBMI<br>Adherence:<br>· ADHD ≈ follow-up compliance ↓<br>Eating Behaviors:<br>· ADHD ≈ fat and carbohydrate consumption ↑<br>· ADHD ≈ grazing ↑<br>· ADHD ≈ duration of main meals ↓<br>· ADHD ≈ alcohol consumption ↑<br>Psychosocial Outcomes:<br>· ADHD ⟹ comorbidity ↑<br>· ADHD ⟹ health perception ↓<br>· ADHD ≅ depressive symptom level |
| Stenberg et al. (2023) | To comparatively examine the short- and long-term outcomes of BS in individuals with ADHD | Prospective matched cohort (10 years) | 1431 ADHD<br>75% female<br><br>2862 Control<br>77% female | · %EBMIL/%TWL (2 years)<br>· Early complications (within 30 days)<br>· Attendance at follow-up visits<br>· Improvement in comorbidities<br>· Health-related quality of life (HRQoL)<br>· Cardiovascular problems (MACE)<br>· Complication (Self-harm and substance misuse) | Weight Loss:<br>· ADHD group ⊥ %TWL, %EBMIL (1st and 2nd year)<br>Adherence:<br>· Regular attendance at follow-up visits ⟹ probability of adverse outcomes ↓<br>Clinical Outcomes:<br>· ADHD ⟹ early postop complication risk<br>· ADHD ⟹ self-harm risk<br>· ADHD ⟹ substance misuse risk |
| Testa et al. (2020) | To examine the predictive role of psychological symptoms and impulsivity in patients with unsuccessful BS outcomes (%EWL < 50) | Cross-sectional case-control | N= 69<br><br>17 Case<br>52 Control<br><br>88% female | · Weight loss %EWL (12 ay)<br>· Psychopathology (SCL-90-R)<br>· Impulsivity (BIS-11)<br>· Eating behavior (DEBQ, BES, YFAS) | Weight Loss:<br>· %EWL ≈ BMI<br>Cognitive Functions:<br>· Attentional impulsivity ⟹ %EWL >50<br>Psychosocial Outcomes:<br>· Higher levels of psychological symptoms, ≈ %EWL<50<br>Eating Behaviors:<br>· Problematic eating behaviors ↛ %EWL |

**Table 4. Overview of included studies ( N=11)**

| Reference | Objective | Study Design | Participants | Outcome Measures | Key Findings |
|---|---|---|---|---|---|
| Kulendran et al. (2017) | To investigate whether preoperative impulsivity predicts postoperative impulsivity and weight loss after BS | Prospective observational (6 months) | N= 45<br><br>71% female | · ΔBMI (6 months)<br>· Impulsivity (BIS-11)<br>· Inhibition control (SST–SSRT)<br>· Delay discounting (TDT) | Weight Loss:<br>· ΔBMI %: RYGB = 25%, SG = 14.1%<br>Cognitive Functions:<br>· Impulsivity and delay discounting ⊥ baseline BMI<br>· Inhibition control ≈ BMI ↓ |
| Hecht et al. (2022) | To examine the relationship between cognitive function, health literacy, and numeracy with pre- and postoperative appointment adherence in BS patients | Retrospective observational | N= 210<br><br>85% female | · Appointment adherence (preoperative and 1-year postoperative)<br>· Health literacy (REALM-SF)<br>· Health numeracy (BMNT)<br>· Cognitive function (MoCA) | Adherence:<br>· Lower cognitive function level ≈ "no-show"<br>· Lower cognitive function level ≈ missed appointments |
| Smith et al. (2023) | To examine whether preoperative cognitive performance predicts postoperative weight loss and whether outcomes differ by type of surgery | Prospective comparative (1 year) | N= 35<br><br>100% female | · %EWL, %TWL, ΔBMI<br>· Global cognitive performance (composite)<br>· Attention (HVLT, LNS)<br>· Processing speed (SDMT)<br>· Executive function (Stroop, TMT)<br>· Memory (HVLT) | Weight Loss:<br>· Pre-op %TWL ⟹ auditory attention (1-year outcome)<br>Cognitive Functions:<br>· Pre-op auditory attention ⟹ %TWL (RYGB group), ↛ %TWL (VSG group)<br>· Pre-op verbal memory ⟹ %TWL (RYGB group), ↛ %TWL (VSG group)<br>· Executive function ⊥ %TWL<br>· Processing speed ⊥ %TWL |
| Walø-Syversen et al. (2020) | To investigate whether preoperative inhibition control predicts postoperative weight loss and whether grazing behavior mediates this relationship | Prospective observational (12 months) | N= 61<br><br>80% female | · %TWL (12 months)<br>· Inhibiton control (SST – SSRT, CWIT)<br>· Working memory (SWM, OTS)<br>· Compulsive grazing (Rep(eat)-Q) | Cognitive Functions:<br>· Response inhibition ⟹ %TWL<br>· Cognitive inhibition (latency) ≈ %TWL<br>· Cognitive inhibition (errors) ⊥ %TWL<br>· Working memory ⊥ %TWL<br>· Spatial planning⊥ %TWL<br>Eating Behaviors:<br>· Compulsive grazing ≈ %TWL |
| Bartsch et al. (2016) | To compare the relationships between physical activity, decision-making, and eating disorders in pre- and postoperative BS patients | Cross-sectional, comparative (2 years postoperative) | N= 144 (pre-op = 71, post-op = 73)<br><br>78% female | · Physical activity (SenseWear Pro2, MET)<br>· Decision-making (IGT)<br>· Eating disorder (EDE-Q) | Cognitive Functions:<br>· Decision-making performance ≅ pre-op, post-op group<br>· Decision-making ⊥ eating disorder symptoms<br>· Decision-making⊥ physical activity levels |

**Table 4. Overview of included studies ( N=11)**

| Reference | Objective | Study Design | Participants | Outcome Measures | Key Findings |
|---|---|---|---|---|---|
| Spitznagel et al. (2013a) | To examine the relationship between preoperative cognitive functions and postoperative %EWL and BMI after BS | Prospective observational (12 months) | N= 84<br><br>80% female | · %EWL and BMI (12 weeks, 12 months)<br>· Attention/Cognitive function (SoA, MT, DS)<br>· Memory (VLT) | Cognitive Functions:<br>· Short-term verbal memory⟹ %EWL, BMI (at 12 months)<br>· Perseverative errors ⟹ %EWL, BMI (at 12 months)<br>· Cognitive functions⊥ %EWL, BMI (at 12 weeks) |
| Spitznagel et al. (2013b) | To examine the relationship between cognitive functions and adherence to postoperative guidelines following BS | Cross-sectional (4–6 weeks postop) | N= 37<br><br>66% female | · Adherence to guidelines (BSSQ)<br>· Attention (CRT)<br>· Cognitive function (VIT, MT)<br>· Memory (VLT) | Weight Loss:<br>· %WL ⊥ cognitive functions<br>Bilişsel İşlevler:<br>· Memory ≈ overall adherence & vitamin-mineral intake<br>· Executive function ≈ physical activity<br>· Attention ≈ protein intake<br>Adherence:<br>· Adherence ⊥ weight loss |

Note. %EBMIL = percentage of excess body mass index loss; %EWL = percentage of excess weight loss; %TWL = percentage of total weight loss; ADHD = Attention Deficit Hyperactivity Disorder; BDI = Beck Depression Inventory; BMI = body mass index; GSI = Global Severity Index; HRQoL = health-related quality of life; MACE = major adverse cardiovascular events; QEWP-R-S = Questionnaire on Eating and Weight Patterns–Revised, Spanish version; SF-36 = 36-item Short Form Health Survey; BS = Bariatric surgery; BES = Binge Eating Scale; BIS = Barratt Impulsiveness Scale; BMNT = Brief Medical Numeracy Test; DEBQ = Dutch Eating Behavior Questionnaire; MoCA = Montreal Cognitive Assessment; REALM-SF = Rapid Estimate of Adult Literacy in Medicine – Short Form; SCL-90-R = Symptom Checklist-90-Revised; SST–SSRT = Stop-Signal Task / Stop-Signal Reaction Time; TDT = Time-based Delay Discounting Task; YFAS = Yale Food Addiction Scale; ; CWIT = Color-Word Interference Test; EDE-Q = Eating Disorder Examination Questionnaire; HVLT = Hopkins Verbal Learning Test; IGT = Iowa Gambling Task; LNS = Letter-Number Sequencing Test; MET = Metabolic Equivalent of Task; OTS = One-Touch Stockings of Cambridge; Rep(eat)-Q = Repetitive Eating Questionnaire; SDMT = Symbol Digit Modalities Test; SST–SSRT = Stop-Signal Task – Stop-Signal Reaction Time; SWM = Spatial Working Memory; TMT = Trail Making Test; BSSQ = Bariatric Surgery Self-Management Questionnaire; CRT = Choice Reaction Time Test; DS = Digit Span Test; MT = Maze Task; SoA = Shifting of Attention Test; VIT = Verbal Interference Test; VLT = Verbal Learning Test

Symbols: ≈ = Correlation; ≅ = No significant difference between groups; ⊥ = No association; ⟹ = Predicts; ↛ = Does not predict; Δ = Change

## Preoperative Cognitive Functions and Weight Loss Outcomes

Findings regarding the relationship between cognitive functions assessed prior to BS and weight loss measures following surgery are reported under this heading. The evaluated outcomes include percentage of excess weight loss (%EWL), percentage of total weight loss (%TWL), and body mass index (BMI). Some studies in the literature (Spitznagel et al. 2013a, Walø-Syversen et al. 2020, Smith et al. 2023) have shown that cognitive functions measured in the preoperative period—such as attention, memory, inhibition, and processing speed—were significantly associated with weight loss indicators in the 6- to 12-month postoperative period. For example, short-term verbal memory performance and perseverative error counts significantly predicted BMI and %EWL at 12 months, whereas these variables were not associated with early postoperative weight loss (12th week) (Spitznagel et al. 2013a). In addition, it has been reported that postoperative weight loss was not significantly associated with cognitive functions such as attention, executive functions, and memory, and similarly, treatment adherence levels did not predict weight loss (Spitznagel et al. 2013b). Another study (Smith et al. 2023) found that auditory attention and verbal memory measures predicted %TWL at one year in individuals undergoing RYGB, whereas this relationship was not observed in the sleeve gastrectomy group. Moreover, the same study reported that executive function and processing speed measures were not significantly associated with %TWL (Smith et al. 2023).

Executive functions such as response inhibition may also be decisive for postoperative weight loss. Walø-Syversen and colleagues (2020) reported that inhibition tests administered approximately one month prior to surgery significantly predicted the percentage of total weight loss. In this study, cognitive inhibition time scores were significantly associated with %TWL after surgery, whereas the number of cognitive inhibition errors was not associated with %TWL (Walø-Syversen et al. 2020). In addition to these results, working memory and spatial planning performance were not associated with %TWL after surgery (Walø-

Syversen et al. 2020). According to the another study (Kulendran et al. 2017), improvements in inhibitory control were significantly associated with reductions in BMI following surgery. However, the same study reported that impulsivity and delay discounting measures were not significantly associated with individuals' baseline BMI levels (Kulendran et al. 2017). In individuals with high levels of attentional impulsivity, the likelihood of achieving surgical success at the level of %EWL > 50 was found to be higher (Testa et al. 2020). However, the same study also reported that problematic eating behaviors did not significantly predict postoperative changes in %EWL (Testa et al. 2020).

On the other hand, some studies reported that preoperative cognitive profiles were not associated with weight loss. According to the study by Nicolau and colleagues (2015), individuals diagnosed with ADHD did not differ significantly from the control group in terms of changes in BMI. Similarly, Marchesi and colleagues (2017) reported that individuals with ADHD had higher preoperative BMI levels and lower weight loss percentages compared to the control group at 6 months, but this difference lost statistical significance at 12 months. In addition, ADHD diagnosis was not significantly associated with surgical success indicators such as %EBMIL and %EWL > 50 (Marchesi et al. 2017). Finally, Stenberg and colleagues (2023) found no significant differences between individuals with ADHD and the control group in terms of %TWL and %EBMIL at both the first and second postoperative years.

## Cognitive Functions and Treatment Adherence Outcomes

Findings regarding the relationship between cognitive domains assessed in the preoperative period—such as attention, memory, executive functions, and processing speed—and adherence to treatment in the postoperative period are evaluated in this section. The findings were assessed within the framework of behavioral adherence indicators such as physical activity, dietary compliance, adherence to medical recommendations, and attendance at follow-up appointments. It was found that cognitive functions measured in the early postoperative period showed significant associations with adherence behaviors to postoperative recommendations (Spitznagel et al. 2013b). Memory levels were found to be associated not only with overall adherence but also with vitamin–mineral intake, while executive function and attention levels were found to be related to physical activity and protein intake (Spitznagel et al. 2013b). Among individuals with lower general cognitive performance, preoperative attendance rates at appointments were reported to be lower, while the frequency of "no-shows" and missed appointments was higher (Hecht et al. 2022). Nicolau and colleagues (2015) reported that individuals with ADHD symptoms had significantly lower adherence rates to follow-up appointments, and that maladaptive eating patterns such as grazing, shorter meal durations, diets high in fat content, and increased alcohol consumption were more prevalent. On the other hand, in the study by Bartsch and colleagues (2016), it was reported that decision-making skills did not differ between groups in the preoperative and postoperative periods, and that decision-making performance was not significantly associated with eating disorder symptoms or physical activity levels.

## Cognitive Risk Profiles and Psychosocial Outcomes

Findings regarding the relationship between cognitive risk profiles identified in the preoperative period—particularly through inattention and impulsivity—and the psychosocial, clinical, and behavioral complications that may emerge in the postoperative period are addressed under this heading. Outcomes such as self-harm, alcohol/substance use, and risk of complications are included in this section. Stenberg and colleagues (2023) reported that individuals diagnosed with ADHD with a history of pharmacological treatment had significantly increased risks of developing self-harm and substance use disorders after surgery; and also that early postoperative complication rates were higher compared to the control group. In the same study, regular attendance at follow-up appointments was identified as a protective factor that reduced the likelihood of these adverse outcomes. According to the study conducted by Nicolau and colleagues (2015), individuals with ADHD symptoms had higher rates of psychiatric comorbidity in the preoperative period and exhibited more frequent eating behavior problems (binge eating, emotional eating, and uncontrolled snacking) in the postoperative period. On the other hand, the same study reported that levels of depressive symptoms did not differ significantly between groups. However, a different

finding was reported, indicating that an ADHD diagnosis did not predict the number of comorbidities individuals had in the preoperative period (Marchesi et al. 2017), which contrasted with earlier results (Nicolau et al. 2015). In the same study, an ADHD diagnosis was also found not to be a significant predictor of surgical success rates at the 12-month follow-up (Marchesi et al. 2017). Compulsive eating behavior was reported to negatively affect weight loss (Walø-Syversen et al. 2020). However, this behavior was not associated with preoperative response inhibition levels and did not serve a mediating role.

The findings demonstrate that cognitive domains such as attention, executive functions, memory, and processing speed, when assessed in the preoperative period, may be associated with surgical outcomes at multiple levels, including postoperative weight loss, treatment adherence, and the sustainability of postoperative behaviors. The classification of findings under thematic headings made it possible to comprehensively evaluate how cognitive functions affect the surgical process in the context of physiological outcomes, adherence behaviors, and cognitive–psychiatric risk indicators. In the discussion section, the findings were evaluated in light of the relevant literature.

# Discussion

The present scoping review aims to evaluate the role of preoperative cognitive functions and processes such as attention, memory, impulsivity, inhibition, and executive functions on surgical outcomes and to bring together the existing empirical findings in the literature on this subject. While previous research (Handley et al. 2016, Thiara et al. 2017, Hathaway et al. 2024) has focused more on improvements in cognitive functions after BS, this study addressed the question in the opposite direction by evaluating how preoperative cognitive functions are associated with surgical outcomes. The studies reviewed provide varying levels of evidence that cognitive functions and processes such as attention, memory, executive functions, and impulsivity may be associated with outcome variables such as postoperative weight loss and treatment adherence. However, it appears that this relationship is not always clear and unidirectional. In the discussion section, the nature of this relationship, the mediating mechanisms, and cognitive risk factors are addressed thematically.

## Relationship between Preoperative Cognitive Functions and Weight Loss Outcomes

There is considerable evidence that cognitive functions assessed prior to BS, such as attention, memory, and inhibition, may be significantly associated with direct clinical outcomes such as postoperative weight loss (Spitznagel et al. 2013a, Walø-Syversen et al. 2020, Smith et al. 2023). Components of executive functions such as attention, memory, and inhibition have been reported to be significantly associated with surgical success indicators, including percentage of excess weight loss (%EWL), percentage of total weight loss (%TWL), and changes in body mass index (BMI). These findings suggest that executive functions may not only be an accompanying feature but also a factor determining surgical outcomes. In particular, the associations of inhibitory control and attentional processes with weight loss may reflect their role in individuals' ability to regulate eating behavior, control portion sizes, and resist high-calorie stimuli in the postoperative period. Similarly, adequate memory and planning skills may support individuals' capacity to recall and implement dietary programs and to organize sustainable health behaviors, thereby contributing to postoperative weight loss.

Studies focusing on response inhibition (Kulendran et al. 2017, Testa et al. 2020, Walø-Syversen et al. 2020) highlight the critical role of the capacity to regulate impulsive eating behaviors in postoperative weight control. These findings suggest that inhibitory control is a decisive cognitive function in enabling individuals to resist high-calorie food stimuli, sustain portion control, and manage non-hunger-related eating urges in the postoperative period. Furthermore, not only the level of cognitive performance but also the behavioral reflections of this performance in daily life appear to influence surgical outcomes. For example, the study by Nederkoorn and colleagues (2006) indicated that individuals with limited delay of gratification skills experienced more difficulties in weight management processes, and that higher levels of impulsivity were associated with poorer weight control, pointing to the possibility that the relationship between impulsivity and weight control may be shaped through behavioral regulation processes.

However, it should also be considered that the effects of cognitive functions on surgical outcomes may follow a temporal pattern. Some studies have reported that cognitive determinants are not effective in the early postoperative period (short-term outcomes such as %TWL, BMI) but become more evident at longer follow-up periods, such as 12 months (Spitznagel et al. 2013a). This temporally changing effect suggests that early postoperative weight loss is shaped more by the physiological and hormonal effects of surgery, whereas in the long term, executive function skills such as attention, inhibitory control, and planning play a decisive role in supporting sustainable weight loss. Especially in long-term weight management, since individuals need to engage in executive function–based behaviors such as self-regulation, adherence to dietary plans, and maintenance of exercise behaviors, the role of cognitive functions in this process may increase over time.

Nevertheless, some studies in the literature have reported that preoperative cognitive functions are not associated with postoperative weight loss outcomes. For instance, Spitznagel and colleagues (2013b) reported that preoperative cognitive functions and levels of treatment adherence did not predict postoperative weight loss, which suggests that early weight loss may be shaped primarily by physiological mechanisms. Findings indicated that measures of executive function and processing speed were not associated with weight loss rates in the sleeve gastrectomy group, suggesting that physiological differences related to the type of surgery may limit the role of cognitive determinants (Smith et al. 2023). Working memory, spatial planning, and cognitive inhibition errors were also reported not to be significantly associated with weight loss (Walø-Syversen et al. 2020). This suggests that only certain subdimensions of inhibition (e.g., speed/time) may be associated with clinical outcomes, whereas higher-level executive functions such as working memory and spatial planning may not directly determine short-term postoperative weight loss but may instead be effective in processes requiring sustainability, such as complex planning, organizing meal preparation, and long-term behavioral change.

It was further stated that impulsivity and delay discounting measures were not associated with preoperative BMI (Kulendran et al. 2017). This indicates that weight gain cannot be explained solely by cognitive traits such as impulsivity and that eating behaviors should be evaluated in combination with environmental, emotional, and metabolic factors. It also raises the possibility that impulsivity may influence obesity indirectly through eating behavior rather than having a direct effect. Problematic eating behaviors were likewise found not to predict postoperative weight loss (Testa et al. 2020). This suggests that problematic eating behaviors in the postoperative period may pose a risk not for determining weight loss per se but more for long-term sustainability and weight regain. In addition, it appears that not only the quantity but also the psychosocial and emotional processes triggering problematic eating behaviors should be evaluated. Finally, an ADHD diagnosis was found not to be significantly associated with surgical success measures such as %EBMIL and %EWL > 50, while no significant difference in BMI change was reported among individuals with ADHD (Marchesi et al. 2017, Nicolau et al. 2015). These findings suggest that ADHD may not be a direct determinant of postoperative weight loss but may influence long-term outcomes indirectly through treatment adherence, eating behavior patterns, and lifestyle sustainability.

## Indirect Effects of Cognitive Functions through Behavioral Processes

Adherence after BS is closely related not only to the individual's motivation but also to cognitive functions. The studies included in the present review indicate that cognitive processes, particularly attention, executive functions, and memory, play a decisive role in the frequency, sustainability, and comprehensiveness of adherence to treatment guidelines. For example, Spitznagel and colleagues (2013b) demonstrated that memory levels were associated with overall adherence as well as vitamin–mineral intake, while executive function and attention levels were associated with physical activity and protein consumption. Similarly, participants with lower cognitive performance in the preoperative period were more likely to miss healthcare appointments (Hecht et al. 2022). In another study (Nicolau et al. 2015), individuals with ADHD symptoms were reported to have lower attendance rates at follow-up appointments, and maladaptive behavioral patterns that could interfere with postoperative treatment adherence—such as grazing, rapid eating, and alcohol consumption—were more prevalent in this group.

Current findings indicate that cognitive functions play a critical role not only in access to knowledge but also in the transformation of that knowledge into behavior. Adherence to treatment is not only about "knowing what to do" but also about being able to act at the appropriate time, maintain the behavior, and avoid deviation despite distractors. These abilities are directly related to higher-order cognitive processes evaluated within the scope of executive functions, such as planning, prioritization, and cognitive consistency. Consistently, as defined by Diamond (2013), executive functions consist of three core components—inhibitory control, working memory, and cognitive flexibility—and these components form the fundamental building blocks not only of cognition but also of behavioral adherence.

On the other hand, it is noteworthy that the findings related to decision-making processes, which constitute one of the subcomponents of executive functions, are inconsistent. In the study by Bartsch and colleagues (2016), decision-making performance did not differ between groups in the preoperative and postoperative periods, and no significant relationship was reported between decision-making performance and eating disorder symptoms or physical activity levels. This finding suggests that the decision-making function may have a limited role in directly determining behavioral adherence in the postoperative period. Decision-making is a complex process that includes subcomponents such as risk assessment, delay of gratification, and planning, and a more detailed evaluation at the subcomponent level is needed to fully reveal the effect of this function on behavioral outcomes. Furthermore, it should be considered that decision-making processes may play an indirect role in the sustainability and long-term adherence of behaviors such as eating habits and physical activity, rather than directly influencing these behavioral outcomes. Finally, the maladaptive behaviors observed in the postoperative period should not be regarded as a "lack of willpower" but should be evaluated in the context of executive function deficits. Within this framework, it can be suggested that individuals with lower levels of executive function in the preoperative period carry a higher risk in the postoperative process and may benefit more from structured psychoeducational and cognitive interventions. Otherwise, individuals who experience difficulties in these domains may have trouble organizing and transforming the instructions provided during follow-up into sustainable behaviors, even if they understand them.

## Cognitive Risk Factors and Psychiatric Symptoms

Psychiatric symptoms observed in individuals who are candidates for BS may not directly affect surgical outcomes but may represent risk factors that could influence them indirectly, particularly in terms of long-term sustainability. In this context, attention-deficit/hyperactivity disorder (ADHD) is one of the most frequently discussed diagnoses in the BS process. However, it is noteworthy that studies on the impact of ADHD on surgical outcomes have yielded different results depending on follow-up periods. After one year of follow-up, no significant difference in weight loss was reported between individuals with ADHD and the control group (Marchesi et al. 2017). However, this result should be interpreted with caution, since the study included only individuals who attended follow-up appointments regularly. This limits its ability to represent the general clinical picture, as individuals lost to follow-up—who may carry higher risk—were excluded. Moreover, since the effects of ADHD may emerge over time, these early findings may be insufficient to capture long-term outcomes. In the two-year follow-up study (Nicolau et al. 2015), although an ADHD diagnosis did not directly affect postoperative weight loss, individuals with ADHD were found to have lower treatment adherence rates and to more frequently engage in impulsive behaviors such as grazing, defined as consuming small amounts of food in an uncontrolled manner, and rapid eating. In terms of long-term outcomes, in a nationwide matched cohort study with a four-year follow-up (Stenberg et al. 2023), individuals with ADHD were found to have multiple clinical risks, including not only reduced weight loss but also increased postoperative complications, self-harm, and substance use. In quality-of-life assessments, marked declines were reported particularly in the domains of mental health. These longitudinal comparative findings indicate that the impact of ADHD is not limited to the early postoperative period but represents a multidimensional risk factor that may threaten long-term sustainability.

According to Barkley's (1997) model of executive functions, ADHD is defined not only by problems with attention or impulsivity but also by impairments in multiple executive functions due to deficits in behavioral inhibition. These functions include working memory, self-regulation, internalized speech, and

behavioral synthesis; impairments in these processes prevent individuals from pursuing long-term goals and maintaining rule-governed behavior. Therefore, it can be inferred that the risk factor in the BS process is not only the ADHD diagnosis itself but also the level of executive functioning it affects in the individual. In this context, it may be more comprehensive in the psychiatric evaluations of surgical candidates to focus not only on diagnostic categories but also on the capacity to sustain daily functioning, including attention, impulse control, planning, and organization.

The current findings also indicate that an ADHD diagnosis may not always co-occur with the expected psychiatric comorbidities. Marchesi and colleagues (2017) reported that ADHD did not predict the number of comorbidities in the preoperative period, while Nicolau and colleagues (2015) found no significant differences in depressive symptom levels between individuals with ADHD and the control group. These findings suggest that psychiatric symptoms accompanying ADHD in BS candidates may not always increase and that psychiatric risks may vary depending on individual differences, symptom profiles, and treatment-seeking motivations. Therefore, in preoperative psychiatric evaluations, adopting an approach that emphasizes symptom levels and functioning rather than a purely diagnostic perspective may contribute to the assessment process. From another perspective, it has also been suggested that the relationship between ADHD and obesity is based not only on behavioral but also on neurobiological commonalities. Cortese (2019) argued that this relationship is bidirectional and that both ADHD may lead to obesity and obesity may give rise to ADHD-like symptoms. Shared mechanisms may include dopaminergic dysfunction, impulsive eating behaviors, increased reward sensitivity, and prefrontal cortex dysfunction. Hedonic eating, nighttime snacking, and excessive eating following negative affect have been reported to be more frequently observed in association with ADHD symptoms (Cortese 2019). These symptoms correspond to behavioral patterns that pose risks for treatment adherence in the postoperative process.

In line with the presented findings, although an ADHD diagnosis may not be a direct determinant of surgical success, it should be considered a risk factor that may complicate postoperative adherence and require additional assessment/intervention through multilayered pathways of interaction. In clinical practice, these findings indicate the need to go beyond a diagnosis-based approach in psychiatric evaluation processes and to take into account individual functioning, neurocognitive profile, and the dynamics of change over time.

## Contributions, Limitations, and Future Directions

This review offers an original contribution to the field by demonstrating that the success of BS depends not only on anatomical modifications but also on the individual's level of cognitive and psychiatric preparedness. In particular, executive functions such as attention, inhibition, working memory, and cognitive flexibility have been shown to significantly influence behavioral adherence in the postoperative period and the achievement of long-term weight loss. Within clinical evaluation processes, it is therefore essential to assess not only general psychopathology but also vulnerable cognitive domains through structured instruments, as this is critical for developing individualized intervention plans. The significance of this study lies in its systematic examination of preoperative cognitive functions in relation to surgical outcomes, an area that has not previously been comprehensively reviewed in the literature. Furthermore, it advances the field by conceptualizing cognitive functions not merely as domains of postoperative improvement but also as determinants that directly shape surgical outcomes.

While the studies included in this review make important contributions to the literature, several methodological and conceptual limitations should be acknowledged. First, many investigations relied primarily on short-term follow-up data of only 6–12 months, which restricts the evaluation of cognitive and psychiatric processes that unfold over time. Second, there was marked heterogeneity in the measurement tools employed: some studies utilized objective measures such as computerized neuropsychological tests, whereas others relied solely on self-report scales. Such discrepancies limit both internal validity and the comparability of findings across studies. In addition, the predominance of female participants, the frequent use of single-center samples, and the variability in the operational definitions of dependent and

independent variables (e.g., %EWL, %TWL, BMI) reduce the generalizability of the results. Finally, the use of diverse neurocognitive test batteries to assess cognitive functioning further complicated the ability to interpret the findings in a comprehensive manner.

In the preoperative phase of BS, psychiatric conditions such as depression, anxiety, and eating disorders emerge as critical factors that warrant careful consideration due to their potential impact on the surgical process and outcomes. Nicolau and colleagues (2015) demonstrated that individuals with obesity who also exhibited ADHD symptoms were more likely to present comorbid depression and anxiety, suggesting that these psychiatric features may accompany and influence the surgical course. Similarly, Marchesi and colleagues (2017) assessed such symptoms in the preoperative period, although their associations with surgical outcomes were not examined. Nevertheless, the majority of studies included in this review did not systematically address the effects of depression, anxiety, and eating disorders on surgical trajectories and outcomes. This highlights the limited availability of empirical data directly examining the relationship between preoperative psychiatric disorders and BS outcomes.

While this review underscores key knowledge gaps in the literature, it also provides guiding directions for future research. Although a substantial body of work has examined postoperative cognitive changes following BS, empirical investigations focusing systematically on the impact of preoperative cognitive and psychiatric preparedness on surgical processes and outcomes remain scarce. To advance the field, long-term follow-up studies of at least two to three years are needed to capture the temporal dynamics of cognitive determinants of postoperative success. Such research should extend beyond weight loss metrics to include indicators such as exercise adherence, treatment compliance, attendance at follow-up visits, and non-eating-related behavioral outcomes.

Moreover, future studies should move beyond examining direct associations and instead develop structural models that clarify the pathways through which cognitive functions affect surgical outcomes—particularly via mediating mechanisms such as self-regulation, health behaviors, and treatment adherence. In this context, evidence suggests that BS may hold potential benefits not only for disorders linked to attentional processes, such as ADHD, but also for other cognitive conditions, including mild cognitive impairment (MCI) and dementia. However, empirical research in these populations remains extremely limited. Therefore, prospective studies are urgently needed to investigate how BS affects the surgical course, weight loss outcomes, treatment adherence, and long-term trajectories of cognitive functioning in individuals with MCI or dementia.

The literature examining the relationship between preoperative cognitive functions and BS outcomes has largely focused on attention-deficit/hyperactivity disorder (ADHD). This indicates that the emphasis placed on ADHD in the present review is not a methodological preference but rather a reflection of the current distribution of the available literature. Nevertheless, the scarcity of empirical data concerning cognitive disorders other than ADHD highlights the need for further research in this area. Accordingly, this review does not remain limited to findings within the ADHD context but also underscores the importance of studies that investigate the role of other cognitive impairments in the BS process.

Finally, future research should prioritize the standardization of assessment tools, the diversification of study samples (in terms of gender, age, and socioeconomic background), and the adoption of multicenter data collection approaches, as these strategies may help reduce inconsistencies in the literature. Moreover, multidisciplinary studies that examine the associations between neurobiological markers and cognitive performance in greater depth could contribute to a more comprehensive understanding of the cognitive underpinnings of BS.

## Conclusion

The present review systematically synthesized the empirical literature investigating the role of preoperative cognitive functioning in BS outcomes. While most existing studies have primarily focused on the beneficial effects of BS on cognitive functions such as attention and memory, this review represents one of the few works to examine the reverse association—namely, the predictive role of preoperative

cognitive functioning on surgical outcomes. In this regard, the study not only summarizes the current evidence but also provides clinically relevant implications, particularly emphasizing the importance of integrating assessments of executive functions and attentional processes into preoperative evaluations.

Findings suggest that cognitive domains such as attention, executive functioning, and impulse control are related not only to weight loss and changes in body mass index but also to behavioral processes including treatment adherence, maintenance of lifestyle changes, and follow-up attendance. This highlights that preoperative cognitive assessments may serve as a valuable tool for predicting behavioral adjustment and long-term outcomes after surgery. In addition, psychiatric vulnerabilities such as attention-deficit/hyperactivity disorder may influence a range of postoperative outcomes, including complications, behavioral dysregulation, and diminished quality of life. However, the lack of empirical studies examining the preoperative role of other psychiatric conditions—such as depression, anxiety, and eating disorders—points to a critical gap and future direction for research. Ultimately, surgical success appears to be determined not only by the quality of the physiological intervention but also by the individual's cognitive and psychological preparedness. Moreover, it is essential to evaluate executive functions not only through clinical tests but also in relation to how these functions manifest in everyday behaviors. Sustained health behaviors that determine postoperative success are closely linked with cognitive flexibility, planning, and self-regulation skills. Within this framework, conducting neuropsychological assessments in the preoperative period may play a critical role in enhancing surgical preparedness and supporting behavioral adjustment in the postoperative phase.

In conclusion, this review provides a systematic foundation for the growing awareness of cognitive and psychological factors in BS. Beyond summarizing the existing body of evidence, it contributes to the development of clinically applicable risk assessment models. By highlighting the often-overlooked reverse association between preoperative cognitive functions and surgical outcomes, the study offers a conceptual framework for future research and underscores the need for further empirical investigation in this domain.

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# Appendix 1. Full Search Strategies by Database

| Databases | Fields searched (e.g., title, abstract, keywords) | |
|---|---|---|
| Web of Science | All fields | The first screening<br>"bariatric surgery" OR "obesity surgery" OR "weight loss surgery" OR gastric* OR sleeve* OR "Roux-en-Y" (All Fields) AND "executive function" OR "cognitive function" OR "cognitive performance" OR "cognitive ability" OR "neurocognition" OR "cognitive control" OR "cognitive processing" OR attention OR memory OR "working memory" OR cognit* OR "reward sensitivity" OR impuls* OR "decision making" OR "response inhibition" OR "problem solving" OR "processing speed" OR "cognitive flexibility" OR "delay discounting" OR "self-regulation" OR "risk-taking" (All Fields)<br>The second screening (Filtered)<br>"bariatric surgery" OR "obesity surgery" OR "weight loss surgery" OR gastric* OR sleeve* OR "Roux-en-Y" (All Fields) and "executive function" OR "cognitive function" OR "cognitive performance" OR "cognitive ability" OR "neurocognition" OR "cognitive control" OR "cognitive processing" OR attention OR memory OR "working memory" OR cognit* OR "reward sensitivity" OR impuls* OR "decision making" OR "response inhibition" OR "problem solving" OR "processing speed" OR "cognitive flexibility" OR "delay discounting" OR "self-regulation" OR "risk-taking" (All Fields) and Article (Document Types) and 2006 or 2007 or 2008 or 2009 or 2010 or 2025 or 2024 or 2023 or 2022 or 2021 or 2020 or 2019 or 2018 or 2017 or 2016 or 2015 or 2014 or 2013 or 2012 or 2011 (Publication Years) and Science Citation Index Expanded (SCI-EXPANDED) or Social Sciences Citation Index (SSCI) or Emerging Sources Citation Index (ESCI) (Web of Science Index) and English or Turkish (Languages) and Surgery or Nutrition Dietetics or Neurosciences or Multidisciplinary Sciences or Psychiatry or Clinical Neurology or Behavioral Sciences or Psychology Clinical or Psychology or Psychology Multidisciplinary or Psychology Biological or Psychology Experimental or Neuroimaging or Psychology Applied or Social Sciences Interdisciplinary (Web of Science Categories) |
| Scopus | Title, Abstract, Keywords | The first screening<br>( TITLE-ABS-KEY ( "bariatric surgery" OR "obesity surgery" OR "weight loss surgery" OR gastric* OR sleeve* OR {Roux-en-Y} ) AND TITLE-ABS-KEY ( "executive function" OR "cognitive function" OR "cognitive performance" OR "cognitive ability" OR "neurocognition" OR "cognitive control" OR "cognitive processing" OR attention OR memory OR "working memory" OR cognit* OR "reward sensitivity" OR impuls* OR "decision making" OR "response inhibition" OR "problem solving" OR "processing speed" OR "cognitive flexibility" OR "delay discounting" OR "self-regulation" OR "risk-taking" ) )<br>The second screening (Filtered)<br>( TITLE-ABS-KEY ( "bariatric surgery" OR "obesity surgery" OR "weight loss surgery" OR gastric* OR sleeve* OR {Roux-en-Y} ) AND TITLE-ABS-KEY ( "executive function" OR "cognitive function" OR "cognitive performance" OR "cognitive ability" OR "neurocognition" OR "cognitive control" OR "cognitive processing" OR attention OR memory OR "working memory" OR cognit* OR "reward sensitivity" OR impuls* OR "decision making" OR "response inhibition" OR "problem solving" OR "processing speed" OR "cognitive flexibility" OR "delay discounting" OR "self-regulation" OR "risk-taking" ) ) AND ( LIMIT-TO ( SUBJAREA , "NEUR" ) OR LIMIT-TO ( SUBJAREA , "PSYC" ) ) AND ( LIMIT-TO ( DOCTYPE , "ar" ) ) AND ( LIMIT-TO ( LANGUAGE , "English" ) OR LIMIT-TO ( LANGUAGE , "Turkish" ) ) AND ( LIMIT-TO ( PUBYEAR , 2006 ) OR LIMIT-TO ( PUBYEAR , 2007 ) OR LIMIT-TO ( PUBYEAR , 2008 ) OR LIMIT-TO ( PUBYEAR , 2009 ) OR LIMIT-TO ( PUBYEAR , 2010 ) OR LIMIT-TO ( PUBYEAR , 2011 ) OR LIMIT-TO ( PUBYEAR , 2012 ) OR LIMIT-TO ( PUBYEAR , 2013 ) OR LIMIT-TO ( PUBYEAR , 2014 ) OR LIMIT-TO ( PUBYEAR , 2015 ) OR LIMIT-TO ( PUBYEAR , 2016 ) OR LIMIT-TO ( PUBYEAR , 2017 ) OR LIMIT-TO ( PUBYEAR , 2018 ) OR LIMIT-TO ( PUBYEAR , 2019 ) OR LIMIT-TO ( PUBYEAR , 2020 ) OR LIMIT-TO ( PUBYEAR , 2021 ) OR LIMIT-TO ( PUBYEAR , 2022 ) OR LIMIT-TO ( PUBYEAR , 2023 ) OR LIMIT-TO ( PUBYEAR , 2024 ) OR LIMIT-TO ( PUBYEAR , 2025 ) ) |
| PubMed | All fields | The first screening<br>("bariatric surgery"[All Fields] OR "obesity surgery"[All Fields] OR "weight loss surgery"[All Fields] OR "gastric*"[All Fields] OR "sleeve*"[All Fields] OR "Roux-en-Y"[All Fields] OR "gastric bypass"[All Fields]) AND ("executive function"[All Fields] OR "cognitive function"[All Fields] OR "cognitive performance"[All Fields] OR "cognitive ability"[All Fields] OR "neurocognition"[All Fields] OR "cognitive control"[All Fields] OR ("attention"[MeSH Terms] OR "attention"[All Fields] OR "attentions"[All Fields] OR "attention s"[All Fields] OR "attentional"[All Fields] OR "attentive"[All Fields] OR "attentively"[All Fields] OR "attentiveness"[All Fields]) OR ("memories"[All Fields] OR "memory"[MeSH Terms] OR "memory"[All Fields] OR "memory |

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| | | s"[All Fields]) OR "working memory"[All Fields] OR "cognit*"[All Fields] OR "reward sensitivity"[All Fields] OR "impuls*"[All Fields] OR "decision making"[All Fields] OR "response inhibition"[All Fields] OR "problem solving"[All Fields] OR "processing speed"[All Fields] OR "cognitive flexibility"[All Fields] OR "delay discounting"[All Fields] OR "self-regulation"[All Fields] OR "risk-taking"[All Fields])<br>The second screening (Filtered)<br>(("bariatric surgery"[All Fields] OR "obesity surgery"[All Fields] OR "weight loss surgery"[All Fields] OR "gastric*"[All Fields] OR "sleeve*"[All Fields] OR "Roux-en-Y"[All Fields] OR "gastric bypass"[All Fields]) AND ("executive function"[All Fields] OR "cognitive function"[All Fields] OR "cognitive performance"[All Fields] OR "cognitive ability"[All Fields] OR "neurocognition"[All Fields] OR "cognitive control"[All Fields] OR ("attention"[MeSH Terms] OR "attention"[All Fields] OR "attentions"[All Fields] OR "attention s"[All Fields] OR "attentional"[All Fields] OR "attentive"[All Fields] OR "attentively"[All Fields] OR "attentiveness"[All Fields]) OR ("memories"[All Fields] OR "memory"[MeSH Terms] OR "memory"[All Fields] OR "memory s"[All Fields]) OR "working memory"[All Fields] OR "cognit*"[All Fields] OR "reward sensitivity"[All Fields] OR "impuls*"[All Fields] OR "decision making"[All Fields] OR "response inhibition"[All Fields] OR "problem solving"[All Fields] OR "processing speed"[All Fields] OR "cognitive flexibility"[All Fields] OR "delay discounting"[All Fields] OR "self-regulation"[All Fields] OR "risk-taking"[All Fields])) AND ((excludepreprints[Filter]) AND (classicalarticle[Filter] OR clinicalstudy[Filter] OR clinicaltrial[Filter] OR clinicaltrialphasei[Filter] OR clinicaltrialphaseii[Filter] OR clinicaltrialphaseiii[Filter] OR clinicaltrialphaseiv[Filter] OR comparativestudy[Filter] OR controlledclinicaltrial[Filter] OR meta-analysis[Filter] OR observationalstudy[Filter] OR randomizedcontrolledtrial[Filter]) AND (humans[Filter]) AND (english[Filter] OR turkish[Filter]) AND (2006:2025[pdat])) |