

Efficacy of systemic integral neurorehabilitation on cognitive function and functional capacity in women with severe obesity: A systematic review protocol

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Abstract

Background: Severe obesity is a multisystemic chronic disease associated with significant neurocognitive impairments, including deficits in executive functions, memory, and attention. Traditional weight loss interventions often overlook these neurological and psychosocial barriers. Systemic Neuro-Integral Rehabilitation, combining cognitive training, functional neurorehabilitation, and Cognitive-Behavioral Therapy (CBT), emerges as a holistic approach to bridge this gap. This protocol outlines a systematic review to evaluate the efficacy of these multidisciplinary interventions in women with severe obesity. **Methods:** This review will follow the PRISMA guidelines and is registered in PROSPERO (CRD420261356828). A systematic search will be conducted in MEDLINE (via PubMed), Scopus, and Web of Science for Randomized Controlled Trials (RCTs) involving women with severe obesity (BMI 40 kg/m² or 35 kg/m² with comorbidities). Interventions of interest include cognitive and functional neurorehabilitation compared to conventional exercise or nutritional education. Two independent reviewers will perform study selection, data extraction, and risk of bias assessment using the Cochrane RoB 2 tool. Data will be synthesized through a narrative approach and, if feasible, a meta-analysis using random-effects models. **Results:** The review aims to demonstrate that integrated neurofunctional interventions lead to superior improvements in executive functions, working memory, and functional capacity compared to isolated treatments. Additionally, improvements in mental health (anxiety, depression, and body image) and autonomic regulation (heart rate variability) are anticipated. **Conclusion:** By synthesizing evidence on neurocentric approaches, this review seeks to provide a foundation for new clinical guidelines that prioritize cognitive health as a pillar for long-term therapeutic success and autonomy in women with severe obesity.

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Keywords: Severe obesity; neurological rehabilitation; neurorehabilitation; executive function; cognitive behavioral therapy.

BACKGROUND

Severe obesity is a chronic multisystemic disease that extends beyond metabolic dysfunction, frequently affecting the central nervous system and resulting in neurocognitive impairment¹. Patients with this condition commonly present deficits in executive functions, memory, and attention factors that can hinder treatment adherence and reduce functional independence^{2,3}.



Although traditional clinical approaches prioritize weight loss through caloric restriction and physical exercise, they often fail to address the underlying psychosocial and neurological barriers⁴. Interventions based on Cognitive-Behavioral Therapy (CBT) have demonstrated efficacy in improving psychological variables, such as anxiety, depression, and body image dissatisfaction⁵⁻⁷. However, the integration of these therapies into a Systemic Neuro-Integral Rehabilitation model emerges as a necessary holistic strategy to bridge this therapeutic gap.

Beyond the direct metabolic impact, evidence suggests that the chronic low-grade inflammatory state characteristic of severe obesity plays a deleterious role in neuroplasticity and white matter integrity⁸. This neuroinflammation may underpin mood disorders and failures in inhibitory control, creating a cycle where neurological impairment reinforces dysfunctional eating behavior⁸.

While isolated studies explore tools such as cognitive stimulation, whole-body electromyostimulation (WB-EMS), or psychological support via CBT, there is still a lack of synthesis determining how the combination of these fronts within Systemic Integral Neurorehabilitation potentiates clinical outcomes. Therefore, this systematic review is justified by the need to synthesize evidence regarding the efficacy of multidisciplinary approaches that target not only physical markers but also neurological health, functional capacity, and autonomic balance, aiming to improve the overall quality of life of women with severe obesity.

METHODS

This systematic review will be conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The detailed protocol for this research has been previously registered in the PROSPERO database under the identification number: CRD420261356828.

Eligibility Criteria (PICO)

The selection of studies will be based on the following components:

- Population (P): Women diagnosed with severe obesity, defined by a Body Mass Index (BMI) 40 kg/m² or 35 kg/m² in the presence of comorbidities. The focus will be on the adult population, with no strict age restrictions.
- Intervention (I): Programs involving cognitive rehabilitation therapies and functional neurological rehabilitation.
- Comparator (C): Conventional therapeutic exercise, isolated nutritional education, or the absence of specific neurorehabilitation interventions.
- Outcomes (O): Improvement in cognitive functions (memory, attention, executive functions), physical functionality (activities of daily living), and reduction of neurological/neuroinflammatory symptoms.
- Study Design (S): Only Randomized Controlled Trials (RCTs) will be included.

Search Strategy and Information Sources

A bibliographic search will be performed across the MEDLINE (via PubMed), Scopus, and Web of Science databases. No language or publication date restrictions will be applied. The search strategy will utilize MeSH terms and descriptors related to "Severe Obesity", "Neurorehabilitation", "Cognitive Training", and "Functional Recovery". Additionally, a manual search will be conducted through reference list screening (backward search) and grey literature to ensure data completeness.

Study Selection and Data Extraction

Screening of titles and abstracts, as well as full-text reviews, will be performed independently by two reviewers using the Rayyan software. Discrepancies will be resolved by consensus or by a third senior reviewer. Data extraction will collect information regarding authorship, year, sample characteristics, intervention details, and quantitative results.

Risk of Bias Assessment

The risk of bias of the included clinical trials will be assessed using the RoB 2 (Revised Cochrane risk-of-bias tool for randomized trials). Domains such as the randomization process, deviations from intended interventions, missing outcome data, measurement of the outcome, and selection of the reported result will be analyzed.

Data Synthesis

For the narrative synthesis, findings will be grouped and discussed qualitatively based on the nature of the interventions and the outcomes (cognitive, functional, and psychosocial). If the studies present clinical and statistical homogeneity (comparable populations and interventions), the data will be combined quantitatively through meta-analysis. Statistical heterogeneity will be assessed using the Chi-squared (χ^2) test and the I^2 statistic. In cases of high heterogeneity ($I^2 > 50\%$), a random-effects model will be utilized.

RESULTS

This systematic review is expected to provide a robust and integrated synthesis of the efficacy of Systemic Integral Neurorehabilitation in the management of women with severe obesity. Anticipated results suggest that integrated multidisciplinary interventions will demonstrate superior positive effects compared to isolated approaches, particularly regarding the enhancement of executive functions such as decision-making and inhibitory control and working memory.

Regarding mental health, it is expected that systemic rehabilitation will potentiate the reciprocal effects of weight loss on body image, resulting in clinically significant reductions in anxiety and depression scores, as well as dissatisfaction with physical self-concept.

Furthermore, the analysis is expected to evidence substantial improvements in markers of autonomy, with an emphasis on functional capacity and heart rate variability

(HRV), signaling a more efficient regulation of the autonomic nervous system following neurofunctional interventions.

Finally, the findings may elucidate the modulating role of nutrition on cognition, indicating whether diets with different macronutrient proportions exert distinct influences on cognitive performance and long-term psychological well-being when associated with cognitive-behavioral therapy. Consequently, this study aims to fill a crucial gap in the understanding of the interaction between diet and mental health in this specific population.

DISCUSSION

Based on the available evidence, there is an evident urgency for a paradigm shift in the treatment of severe obesity, proposing a move from a purely anthropometric focus toward a neurocentric and systemic perspective. Regarding the brain-body interconnection, this review will discuss how obesity far from being merely an accumulation of adipose tissue acts by remodeling brain function. In this sense, neuro-integral rehabilitation emerges as a strategy to "restore" compromised neural circuits, which may be the key to facilitating long-term weight loss maintenance, overcoming one of the greatest challenges in current clinical practice.

The role of Cognitive-Behavioral Therapy (CBT) will be central to this analysis, exploring how the integration of cognitive strategies and neurorehabilitation can mitigate attentional bias toward hyper-palatable food stimuli and increase adherence to physical exercise, as corroborated by clinical trials associating dietary intervention with structured psychological support.

Furthermore, the discussion will address the potential of technological and functional innovations, such as whole-body electromyostimulation (WB-EMS) and virtual reality, which serve as crucial adjuvants in neurofunctional rehabilitation, especially for patients with reduced mobility or those in post-bariatric surgery recovery.

Finally, the clinical implications of this synthesis of evidence may provide the foundation for new guidelines for multidisciplinary teams. The core proposal is that the treatment of obesity in women must transcend caloric management, mandatorily incorporating the assessment and training of executive functions. This holistic approach aims to ensure not only a reduction in measurements but also comprehensive therapeutic success and the recovery of the patient's neurofunctional autonomy.

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