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Unlocking inner calm: the co-intervention of psychobiotics and exercise as a strategy against depression, anxiety and neuroinflammation

Desbloqueando do la calma interior: la co-intervención de psicobióticos y ejercicio como estrategia contra depresión, ansiedad y neuroinflamación

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Abstract

Mood disorders, such as depression and anxiety, represent a significant global burden and are associated with high rates of nonresponse to conventional pharmacological treatments. In this context, the gut–microbiota–brain axis has emerged as a new pathophysiological paradigm, in which intestinal dysbiosis, reduced short-chain fatty acid production, and increased intestinal permeability promote the translocation of proinflammatory mediators, triggering neuroinflammation and oxidative stress. The objective of this systematic review was to analyze the scientific evidence on the co-intervention of psychobiotics and physical exercise as an integrative therapeutic strategy for depression and anxiety. A systematic review was conducted in accordance with the PRISMA 2020 statement, through a search of literature published between 2019 and 2025 in databases such as PubMed, Elsevier, JAMA Network, BMJ Group, SciELO, and BMC Psychiatry. Meta-analyses and experimental studies evaluating the therapeutic synergy of specific probiotics and physical exercise were included, and a narrative synthesis and methodological quality assessment were performed. The results demonstrated that specific psychobiotic strains, such as Lactobacillus gasseri and Bifidobacterium longum, in combination with physical exercise, significantly reduce depressive and anxiety symptoms by modulating systemic inflammation, promoting the release of neurotrophic factors, and enhancing neuronal resilience. Overall, the evidence supports the gut–microbiota–brain axis as a central regulator of mood disorders and endorses this co-intervention as a promising and integrative therapeutic strategy.

Keywords: psychobiotics; physical exercise; depression; anxiety; gut–microbiota–brain axis

Resumen

Los trastornos del estado de ánimo, como la depresión y la ansiedad, representan una carga global significativa y se asocian con altas tasas de no respuesta a los tratamientos farmacológicos convencionales. En este contexto, el eje microbiota-intestino-cerebro ha emergido como un nuevo paradigma fisiopatológico, en el que la disbiosis intestinal, la reducción de ácidos grasos de cadena corta y el aumento de la permeabilidad intestinal favorecen la translocación de mediadores proinflamatorios, desencadenando neuroinflamación y estrés oxidativo. El objetivo de esta revisión sistemática fue analizar la evidencia científica sobre la co-intervención de psicobióticos y ejercicio físico como estrategia terapéutica integral para la depresión y la ansiedad. Se realizó una revisión sistemática conforme a la declaración PRISMA 2020, mediante la búsqueda de literatura publicada entre 2019 y 2025 en bases de datos como PubMed, Elsevier, JAMA Network, BMJ Group, SciELO y BMC Psychiatry. Se incluyeron metaanálisis y estudios experimentales que evaluaron la sinergia terapéutica de probióticos específicos y ejercicio físico, realizándose una síntesis narrativa y una valoración de la calidad metodológica. Los resultados demostraron que cepas psicobióticas específicas, como Lactobacillus gasseri y Bifidobacterium longum, en combinación con ejercicio físico, reducen de manera significativa los síntomas depresivos y ansiosos, al modular la inflamación sistémica, favorecer la liberación de factores neurotróficos y mejorar la resiliencia neuronal. En conjunto, la evidencia valida al eje microbiota-intestino-cerebro como un regulador central de los trastornos del ánimo y respalda esta co-intervención como una estrategia terapéutica prometedora e integradora.

Palabras clave: psicobióticos; ejercicio físico; depresión; ansiedad; eje microbiota-intestino-cerebro

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"Unlocking inner calm: the co-intervention of psychobiotics and exercise as a strategy against depression, anxiety and neuroinflammation

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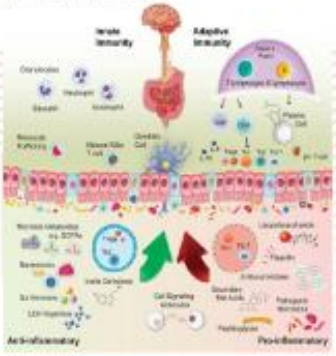
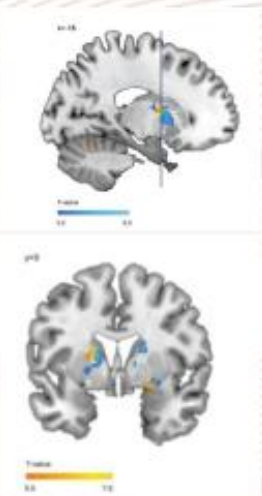
INTRODUCTION

Some neuropsychiatric disorders such as depression and anxiety represent a significant global burden, with high rates of non-response to conventional therapies. The new microbiota–gut–brain axis paradigm proposes that intestinal dysbiosis is a key etiological factor. Dysbiosis reduces short-chain fatty acids (SCFAs), causing intestinal permeability, also known as "leaky gut," generating a pathogenic vicious cycle. This promotes the translocation of pro-inflammatory products, triggering neuroinflammation and oxidative stress, which underlie depression and anxiety.In response to these pathogenic processes, physical exercise and psychobiotics act as powerful modulators. Exercise improves the intestinal environment by increasing blood flow and motility, creating a favorable environment for probiotic bacteria, while probiotics repair the intestinal barrier. We propose that their dual synergistic action offers a more efficient treatment strategy.



RESULTS

The systematic review validates the microbiota–gut–brain axis as a central regulatory axis in the modern pathophysiology of mood disorders (depression and anxiety).The therapeutic key evaluated is the restoration of the homeostasis of this axis, reversing neuroinflammation. The collected evidence demonstrates the effectiveness of psychobiotics in specific strains (e.g., Lactobacillus gasseri, B. longum), which achieve a significant reduction in characteristic symptoms.Synergy was confirmed with the application of physical exercise in combination with probiotics, enhancing the release of neurotrophic factors and neuronal resilience.The relevance of these findings highlights their important implications for the adult population with mood disorders, and suggests that they could become a promising strategy to improve cognition in populations that have not yet been studied, such as autism and AD&D.



OBJETIVE

It is intended to establish a comprehensive therapeutic strategy by presenting the biological causality of the co-intervention of probiotics from specific bacterial strains and the implementation of exercise to help promote intestinal well-being, in order to achieve a reduction in the clinical manifestations of the most common mental disorders.

METHODOLOGY

Type of study: Systematic review based on the official PRISMA 2020 statement.
Databases: PubMed, Frontiers, Elsevier, JAMA Network, SciELO, BMJ Group, Hospital Psiquiátrico de La Habana, MedCrave, BMC Psychiatry.
Period: 2019–2025.
Criteria: Articles with meta-analyses and experimental evaluation that demonstrate the synergy of therapeutic applications of interest, based on specific literature from national academic centers.
Analysis: Narrative synthesis of results and assessment of methodological quality.

CONCLUSIONS

In conclusion, the evidence is categorical: the combination of probiotics and physical exercise represents an integrative and effective treatment model for mood disorders. This therapeutic effect is achieved through the reduction of systemic inflammation and the modulation of neuronal activity, which validates the intervention of the microbiota–gut–brain axis as a central anti-inflammatory pathological mechanism. The fundamental importance of this work lies in its contribution to the understanding of the biological causality of co-intervention in comprehensive mental health, by laying the foundations for the optimization of therapeutic strategies and the search for a reduction in symptoms, redirecting the clinical approach to the aforementioned disorders.

REFERENCES