

# IARCO Competition Literature review proposal - Srihaan Edla.pdf

*by Mr Adnan*

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The Efficacy of Probiotic and Prebiotic Interventions on Adolescent  
Mental Health: Systematic Review and Gaps Analysis: Research  
Proposal

Name: Srihaan Edla  
Institution: Vista Del Lago High School  
Category: Junior Category  
Email: [srihaanedla@gmail.com](mailto:srihaanedla@gmail.com)

**1. Research Question:** How does current or existing scientific literature address the efficacy of probiotic and prebiotic intervention in improving mental health outcomes in adolescents, and what are the methodological limitations that prevent definitive conclusions?

**Introduction:** An emerging body of research has established a bidirectional communication system between the gut microbiota and the brain, known as the gut-brain axis, which is fundamentally reshaping our understanding of mental health and well-being in individuals. The main link between the gut and the brain is the vagus nerve, which conveys sensory information from the gastrointestinal tract to the brain. The microbiota can influence our brain through the immune system, where gut bacteria can produce signals that modulate systemic inflammation, which is increasingly linked to the pathophysiology of depression and anxiety. The microbiota also creates bioactive compounds such as Short-Chain Fatty Acids (SCFAs) and other neurotransmitters that can directly affect our brain. These interactions together have shown a plausible mechanism in which balanced and healthy gut microbiota can support central nervous system function. While the gut-brain axis is active throughout our lives, it is key during adolescence due to profound developmental changes in the brain that coincide with mental health disorders. New evidence suggests that gut microbiota undergoes dynamic changes during adolescence. Changes in the ecosystem could be linked to brain development and increased vulnerability to mental health disorders, which has made prebiotics and probiotics a focus as a potential non-pharmaceutical intervention.

**Literature Review:** The application of probiotics and prebiotics interventions in mental health is a quickly growing field, with promising results from studies conducted on adult populations, which show a positive impact on anxiety and depression (Noonan et al., 2020). However, studies on adolescents remain inconclusive. Recent systematic reviews show a critical lack of definite and conclusive findings and a high degree of diversity across multiple studies (Ammar et al., 2022)(Marx et al, 2023). The primary challenge has been the system of methods that has been used. The existing literature is highly divided, with significant differences in study design, interventions such as microbial stains and dosages, and even the tools used to measure mental health outcomes. This inconsistency and lack of good, high-quality data prevent us from getting a strong synthesis or conclusion of the data. Therefore, a systematic review of this is justified, but very necessary to help connect the fragmented evidence, clarify the current state of the evidence so far, and identify the methodological gaps that need to be addressed and fixed for advancement.

**Research Methodologies:** The systematic review will follow all Preferred Reporting Items for Systematic Review and Meta-analysis guidelines to make sure the process is transparent and clear. This method will be structured to address the question by identifying and assessing existing literature. I will conduct comprehensive searches across multiple electronic databases, which include PubMed, Scopus, the Cochrane Library, and the Web of Science. This search will mainly be done with keywords and also with booleans to search for papers. An example is (probiotics OR Prebiotics OR psychobiotics) AND (adolescent OR teen OR youth OR young adult) AND (mental health OR anxiety OR depression OR mood). I will also be searching Grey Literature and unpublished trials on areas like ClinicalTrials.gov. Studies will be based on the PICO framework for Inclusion and exclusion. Population (P)= Human participants are 10-19 years old. Intervention (I): Administration of probiotics, probiotics. Comparator (C): A

no-treatment or placebo group. Outcome (O): measurement of any mental health problems or cognitive outcomes using valid and clinical assessments. Then I will perform a narrative synthesis to summarize and interpret findings from the studies I have used. The results will be analyzed based on variables like intervention, the duration of it, and the outcomes that were generated. This will be done with a gap analysis to evaluate and find methodological limitations or gaps in these studies, and show where research needs to be done more.

Project Practicalities: This project will take up to 8 months in total to finish, with four different phases to ensure efficient work is being done. In the first phase, for two months, I will be doing comprehensive database searches. This will include creating an initial beginning in the title and finalizing the search strategy. In the second phase, for the next two months, I will be using data from the papers I found and reviewing them. The third phase, which is two months, will be when I analyze the data. This involves doing the narrative synthesis, doing the gaps analysis, evaluating the findings, and drafting the main paper. The final phase, which will take the last two months, will be preparing the document and conducting a peer review on it. This project will require very less financial resources other than access to the standard subscriptions to access the academic databases. This project is very low-cost and doesn't require additional funding

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**Roadblocks and Potential Limitations:** The main limitations of this project are rooted in the current state of research on this topic. The rarity of high-quality studies on this topic will be a significant challenge, preventing a strong statistical synthesis. Also, the heterogeneity across these various studies of intervention and outcome measures will be a roadblock to getting a definitive conclusion. However, these limitations are the exact reason why the systematic review and gap analysis are needed. By identifying and documenting the roadblocks, this project will help give a clear and strong direction for the future, paving the road for more effective research.

**Conclusion & Post Program Plan:** The systematic review is necessary and a strong project that will address a large void in our current literature on psychobiotic intervention for adolescent mental health. I anticipate finding multiple bodies of evidence with many shortcomings and methodological shortcomings. The primary significance of this work will be to help synthesize all the current knowledge we have right now, and mainly help create an evidence-based road map on what we need to focus new research on. These findings from this project will help provide specific recommendations on study design, intervention, and standardization in all of them. To move forward in this research, addressing this research question is key to moving this field. In the long term, this work may have the potential to help guide and move the development of effective and evidence-based pharmacological therapies for adolescents, with a higher understanding of the gut-brain axis.

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