

Gut microbiota and physical activity impact in overweight and obese children and adolescents: a systematic review

INPLASY202370045

doi: 10.37766/inplasy2023.7.0045

Received: 12 July 2023

Published: 12 July 2023

Morgado, M¹; Sousa, M²; Coelho, A³; Costa, J⁴; Seabra, A⁵.**Corresponding author:**

Micaela Morgado

mmorgado.nutritionist@outlook.com

Author Affiliation:

Faculty of Sport, University of Porto, Porto, Portugal.

ADMINISTRATIVE INFORMATION**Support** - This research received no external funding.**Review Stage at time of this submission** - Completed but not published.**Conflicts of interest** - None declared.**INPLASY registration number:** INPLASY202370045**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 12 July 2023 and was last updated on 12 July 2023.**INTRODUCTION**

Review question / Objective The purpose of this systematic review is to explore and examine the differences in the gut microbiota composition of obese and normal-weight children and adolescents and provide an understanding about the effectiveness of physical activity interventions in modulating the microbiota in overweight and obese children and adolescents, for new perspectives in the obesity prevention. The eligibility criteria were framed in accordance with the PICO framework in accordance to the PRISMA statement: population, intervention, comparison, and outcomes. Participants and setting: children with overweight and obesity; Interventions: physical activity and lifestyle programs; Control: normal daily living; Outcomes: changes in gut microbiota composition.

Rationale Childhood overweight and obesity has reached epidemic proportions all over the world. In 2016, over 340 million children and adolescents aged 5 to 19 years were overweight or obese. The etiology of childhood obesity has been attributed to a complex set of factors, including genetic susceptibility, environmental and ecological effects. Investing in children's health across interventions on modifiable factors, such as lifestyle, physical activity, and diet, has been the target of prevention policies and may be the key to facing and solving this health problem. An interesting new point for intervention on modifiable factors is represented by the microorganisms that collectively inhabit the gastrointestinal tract, the so-called "gut microbiota". The gut microbiota composition has been recognized as a key determinant of obesity, namely childhood obesity, since childhood is a critical period for the development of bacteria that colonize the gut.

Previous research has shown that the gut microbiota diversity and abundance in children with obesity is significantly lower than in normal-weight children. Exercise is recognized for stabilizing the development of obesity and modifying the composition of the gut microbiota, increasing the diversity. For these reasons, the manipulation of the gut microbiota through physical activity could be a therapeutic target with potential to decrease childhood obesity.

Condition being studied Gut microbiota composition of overweight and obese children and adolescent.

METHODS

Search strategy The current study is a systematic review of literature focusing on two complemented searches: firstly, describe the gut microbiota profiles in obese and normal-weight children and secondly, evaluate the effectiveness of physical activity interventions in gut microbiota modulation in children and adolescents with overweight or obesity.

A systematic search was conducted in PubMed, Scopus, and Web of Science. The search was done on articles published from 2010 to June 2023. To increase the efficiency of the search and obtain all synonyms gathered in a single descriptor, the search was performed using single-text words in the title and abstract, complemented with Medical Subject Headings (MeSH) terms. To facilitate the search, Boolean logical operators such as truncation (*) and "AND" were used, combining the following groups of key words:

First search: type of population ("Child*" OR "Paediatric*" OR "Infant*") AND health condition (eg. "Obes*" OR "Overweight") AND outcome of interest (eg. "Gut Microbio*" OR "Microbio*").

Second search: type of intervention ("Physical Activity" OR "Exercise") AND type of population ("Child*" OR "Paediatric" OR "Infant") AND health condition (eg. "Obes*" OR "Overweight") AND outcome of interest (eg. "Gut Microbio*" OR "Microbio*").

We searched for further relevant literature using PubMed "related citations" function and reviewing the reference lists for each selected article.

Participant or population Children and adolescent (3-18 years).

Intervention Physical activity interventions.

Comparator Compare obese with non-obese children and compare physical activity interventions with control groups.

Study designs to be included Cross-sectional studies, interventions longitudinal studies and retrospective.

Eligibility criteria The following inclusion criteria were applied: articles in English, studies involving children and adolescents, studies comparing the gut microbiota composition of obese and normal-weight children and adolescents, and studies evaluating physical activity interventions on the gut microbiota composition of children and adolescents. The following exclusion criteria were adopted: children and adolescents with other disease(s), subjects aged under 3 and over 18 years, animal model studies (e.g., mice, rats, pigs, or in vitro), studies with microbiota from another organs (e.g., mouth, nose, skin, or vagina), studies with other interventions (e.g., antibiotic, prebiotic, or probiotic), and editorials, reviews, or meta-analyses.

Information sources A systematic search was conducted in PubMed, Scopus, and Web of Science. The search was done on articles published from 2010 to June 2023. We searched for further relevant literature using PubMed "related citations" function and reviewing the reference lists for each selected article.

Main outcome(s) Children and adolescents between 3 and 18 years old, from various ethnicities: Asian, Latino, Caucasian and mixed. The methods of faecal microbiota analysis were 16S rRNA gene sequencing, Shotgun metagenomics and Quantitative real-time PCR (qPCR) analysis. The duration of the interventions was between 6 weeks and 12 weeks. All of the studies search for inter-individual variations according to body mass index level and the interventions investigated associations between the physical activity practice and the gut microbiota composition.

Quality assessment / Risk of bias analysis The risk of bias was measure using the Risk of Bias Assessment for Non-randomized Studies (RoBANS) tool.

Strategy of data synthesis For a qualitative data synthesis, we reported each outcome that showed significantly higher or lower or non-significant differences for the respective outcome in overweight/obese and normal-weight children and adolescents, as reported by the studies and based on nominal p-values < 0.05.

Subgroup analysis Not applicable.

Sensitivity analysis Not applicable.

Language restriction English.

Country(ies) involved Portugal.

Keywords Childhood, obesity, lifestyle, exercise, intestinal microbiota, Bacteroidetes, microbiota diversity.

Contributions of each author

Author 1 - Micaela Morgado (MM) conceptualized the systematic review. MM developed the search strategy, methodology and perform the literature research. MM edited the final manuscript.

Email: mmorgado.nutritionist@outlook.com

Author 2 - Mónica Sousa (MS) conceptualized the systematic review. MS assisted with screening article and reviewing literature. MS reviewed and modified the manuscript. All authors contributed.

Email: monicavcsousa@gmail.com

Author 3 - André Coelho (AC) assisted with screening article and reviewing literature. AC reviewed and modified the manuscript. AC edited the final manuscript. All authors contributed.

Email: andrebastoscoelho@hotmail.com

Author 4 - Júlio Costa (JC) reviewed and modified the manuscript. All authors contributed.

Email: jahdc@hotmail.com

Author 5 - André Seabra (AS) conceptualized the systematic review. AS assisted with screening article and reviewing literature. AS reviewed and modified the manuscript. All authors contributed.

Email: andre.seabra@fpf.pt