SYSTEMATIC REVIEW

High-intensity interval training effects on ultra-processed food consumption in adolescents: a systematic review

[version 1; peer review: 1 approved with reservations]

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Abstract

Nowadays, within the vigorous intensity activities, there is a huge interest in high-intensity interval training (HIIT), in both research and clinical perspectives. Although HIIT has shown several benefits (e.g. increase in VO2 peak; improving cardiorespiratory fitness and body composition; beneficial effects on cognition and mental health), as far as we know, no systematic review has focused on the HIIT effects on ultra-processed food (UPF) consumption and the relationship between the two remains inconclusive. To fill this gap in the current literature, our review aimed to answer the following question: is HIIT associated with UPF consumption in adolescents? We executed a systematic review that aimed to investigate how HIIT affects UPF consumption. After conducting the search strategy, no articles fitted our inclusion criteria and our systematic review was therefore classified as an empty review.

This absence in the literature highlights shows that is an urgent need for additional epidemiological studies focusing on this issue, for example longitudinal studies and controlled trials, in order to show if there is a relationship between HIIT performance and UPF consumption.

Keywords

ultra-processed food, diet, adolescent, interval training

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1

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[view](#)

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Any reports and responses or comments on the article can be found at the end of the article.

This article is included in the **Agriculture, Food and Nutrition** gateway.

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Introduction

Overweight is an important risk factor for chronic non-communicable diseases.^{1–3} The global prevalence of overweight in adolescents is approximately 20–25%, and is related with high consumption of ultra-processed food (UPF).^{4–8} Generally, UPF are industrially manufactured foods that contain large amounts of calories, trans fats, sugars, sodium, and chemical additives.^{9–11} Overweight is also associated with lower intake of vitamins, minerals, fiber and protein.^{7,8} In this context, reducing the consumption of UPF, as well as improving the amount of physical activity and exercise practice are essential to decreasing the prevalence of overweight in children and adolescents.

Exercise is associated with food consumption and energy intake.^{12,13} Drenowatz *et al.*¹⁴ reported in their review that longitudinal analyses indicate that habitual exercise is beneficial on dietary intake and intake of specific foods. In addition, exercise has been shown to lead to several health benefits in school-aged children and adolescents.^{15–17} To reach wide health benefits, increasing moderate and vigorous activities are indicated, the highest advantage given when exercise is at vigorous intensity.^{18,19} In accordance with the current recommendation for children and young people (5–17 years old), vigorous-intensity activities are critical “including those that strengthen muscle and bone, at least three times per week”.²⁰ Cardiorespiratory fitness and muscular strength are central indicators of health in infants and youth. High cardiorespiratory fitness and muscular strength are related to healthy outcomes and a lower risk of developing diseases in the next decades.^{19,21–23}

Currently, within vigorous intensity activities, there is a surge of interest in high-intensity interval training (HIIT), in both research and clinical perspectives views. In this regard, a recent review²⁴ compared the effects between moderate-intensity continuous training and interval training and showed that interval training provided greater reductions in total absolute fat mass. HIIT refers to alternating short bursts of high intensity activities with recovery periods or light exercise²⁵ and ‘near maximal’ efforts performed at $\geq 80\%$ of the maximal heart rate or the equivalent as expressed in the function of the maximal oxygen consumption.²⁴ Although HIIT has shown several benefits (e.g. increase in VO_2 peak²⁶; improving cardiorespiratory fitness and body composition²⁷; beneficial effects on cognitive performance^{28,29} and mental health²⁹), to the best of our knowledge, no systematic review has focused on HIIT effects on UPF consumption and the relationship between the two remains inconclusive. To fill this gap in the current literature, our study objectives aimed to answer the following question: is HIIT associated with UPF consumption in adolescents? We executed a systematic review that aimed to investigate the influence of HIIT on UPF consumption in adolescents.

Methods

The eligibility criteria were specified according to the Population, Intervention, Comparison, Outcome (PICO) framework: “P”, adolescent; “I”, the practice of high-intensity training; “C”, the use of other therapies or placebo; and “O”, UPF.

The eligibility criteria were articles with the following features: (a) adolescent samples (10–19 years old, as defined by the World Health Organization³⁰); (b) assessment of high-intensity interval training; (c) assessment of UPF consumption; (d) studies with observational and clinical trials designs. No language and year of publication restrictions were applied. Articles with incomplete results and systematic reviews were excluded.

We used three databases (SCOPUS, PubMed, and Embase) for our searches. The search strategy pattern of three blocks of keywords used in PubMed are provided in [Box 1](#). Identical keyword patterns were searched in SCOPUS and Embase. We ran the search for each database in June 2020. The search was performed by two independent researchers (MN and CRM), who also evaluated all references of included articles to find additional sources. Moreover, we also searched in Google Scholar for potential additional articles.

After executing the search strategy, articles from all databases were organized, and duplicates eliminated with Mendeley software (Desktop version - 2021). Two reviewers (MN and CRM) separately screened the titles and abstracts of all studies identified in the literature search to see if they met the eligibility criteria. Disagreements were resolved by a third reviewer (PN). All three reviewers have backgrounds in systematic reviews and were trained on the eligibility criteria.

Results

Eleven suitable articles were recognized (PubMed, 2 studies; SCOPUS, 4 studies; Embase, 5 studies) ([Figure 1](#)). After removal of duplicates, five articles remained.^{31–35} None of the five articles met our eligibility criteria; elimination reasons included that the population was adults and not adolescent, or UPF consumption was not included as an outcome.

Box 1. Search strategy for PubMed.

("adolescent"[MeSH Terms] OR "minors"[MeSH Terms] OR "adolescent"[Title/Abstract] OR "minors"[Title/Abstract] OR "Youth"[Title/Abstract] OR "juvenile"[Title/Abstract] OR "teen"[Title/Abstract] OR "teenager"[Title/Abstract] OR "Childhood"[Title/Abstract] OR "adolescence"[Title/Abstract] OR "schoolchild"[Title/Abstract] OR "Schoolchildren"[Title/Abstract] OR "young"[Title/Abstract])

AND

(Ultra-processed[Title/Abstract] OR "ultra processed"[Title/Abstract] OR ultraprocessed[Title/Abstract] OR food processing[MeSH Terms] OR ready-to-eat[Title/Abstract] OR "ready to eat"[Title/Abstract] OR "ready-to-consume"[Title/Abstract] OR fast food[MeSH Terms] OR "fast-food"[Title/Abstract] OR "fast food"[Title/Abstract] OR fastfood[Title/Abstract] OR "junk food"[Title/Abstract] OR "Ready Prepared Food"[Title/Abstract] OR "Convenience Food"[Title/Abstract])

AND

("High-intensity training"[Title/Abstract] OR "High-intensity interval training"[Title/Abstract] OR "high-intensity interval training"[MeSH Terms] OR "high intensity intermittent training"[Title/Abstract] OR "Repeated sprint training"[Title/Abstract] OR "interval training"[Title/Abstract] OR "intermittent training"[Title/Abstract] OR "high intensity sprint"[Title/Abstract] OR "aerobic interval training"[Title/Abstract] OR "High-intensity interval training"[Title/Abstract] OR "high-intensity interval exercise"[Title/Abstract] OR "high-intensity interval exercise"[Title/Abstract] OR "high-intensity intermittent exercise"[Title/Abstract] OR "high-intensity intermittent exercise"[Title/Abstract] OR "high intensity intermittent training"[Title/Abstract] OR "high intensity intermittent training"[Title/Abstract] OR "HIIE"[Title/Abstract] OR "HIIT"[Title/Abstract]).

Figure 1. Flow diagram from the study.

Conclusions

In accordance with Yaffe *et al.*,³⁶ if no study meets the eligibility criteria, the review is referred to as an 'empty review'; empty reviews are known to contribute to inspiring future research.³⁶ Despite the empty review, we believe that it is pertinent to publish our results as our study identifies a gap in the literature concerning HIIT, adolescents and UPF consumption, and may motivate new investigations on this topic and contribute to progress in this research. The present lack of evidence highlights how essential additional epidemiological research will be, especially those with high quality methods and longitudinal and controlled trial designs.

In adults under a fast food diet, HIIT seems to prevent weight gain and cardiometabolic deterioration.³² These initial findings demand more investigation, as they show promising results against the negative effects of fast foods. Most ready-to-consume foods that are present in fast foods can be considered UPF in the novel classification according to the processing level.^{10,11} In adolescents with obesity, a single HIIT session is associated with reduced energy intake and subsequent food reward.³⁷ Thus, investigating strategies to counteract the deleterious effects of UPF in health is required and HIIT may have a role to play.

Data availability

Underlying data

All data underlying the results are available as part of the article and no additional source data are required.

Reporting guidelines

Figshare: PRISMA checklist for 'High-intensity interval training effects on ultraprocessed food consumption in adolescents: a systematic review', <https://doi.org/10.6084/m9.figshare.15111792.v1>.³⁸

Data are available under the terms of the [Creative Commons Zero "No rights reserved" data waiver](#) (CC0 1.0 Public domain dedication).

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This is an interesting article that proposed to do a meta-analysis review looking at the effects of HIIT exercise on adolescents consuming ultra-processed food. The search methodology for article selection was well done, using the correct Boolean terms in three databases. We realized in our evaluation that other databases could be used, such as Scielo and Lilacs, since the 3 databases selected did not find any paper that related to the theme. For this reason, we believe that it is not possible to replicate the study if other researchers want to use these other two databases.

Finally, the conclusions presented by the authors are valid; however, the question remains, if the search were expanded to other databases, would it find papers related to the proposed theme.

Are the rationale for, and objectives of, the Systematic Review clearly stated?

Yes

Are sufficient details of the methods and analysis provided to allow replication by others?

Partly

Is the statistical analysis and its interpretation appropriate?

Not applicable

Are the conclusions drawn adequately supported by the results presented in the review?

Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Molecular biology, Genetics, Liver tumor; Neuroscience, stress, HPA axis,

Epilepsy, Temporal Lobe Epilepsy, distress.

We confirm that we have read this submission and believe that we have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however we have significant reservations, as outlined above.

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