Contents lists available at ScienceDirect

MethodsX

journal homepage: www.elsevier.com/locate/methodsx

Food consumption and mental health in children and adolescents: A systematic review protocol ☆,☆☆

Milka Barbosa Costa [a], Regina Márcia Ferreira Silva [b], Kaio Vinicius C Silva [c], Suelen Marçal Nogueira [a,d], Lauryane Fonseca Terra [e], Lavínia Leal Cordeiro [a], Emilio Villa-González [f], Priscilla Rayanne E. Silva Noll [d], Matias Noll [c,d,*]

[a] *Universidade Evangélica de Goiás, Campus Ceres, GO, Brasil*
[b] *Instituto Federal de Goiás, Campus Itumbiara, GO, Brasil*
[c] *Faculdade de Nutrição, Universidade Federal de Goiás (UFG), Goiânia, Brasil*
[d] *Instituto Federal Goiano, Campus Ceres, GO, Brasil*
[e] *Universidade Federal de Viçosa, Campus Rio Paranaíba, MG, Brasil*
[f] *Department of Physical Education and Sports, Faculty of Sport Sciences, Sport and Health University Research Institute (IMUDS), University of Granada, Granada, Spain*

ARTICLE INFO

ABSTRACT

Mental illnesses are prevalent among children and adolescents worldwide and may be associated with food consumption. This protocol aims to evaluate the association between food consumption and mental health in children and adolescents through a systematic review and meta-analysis. The electronic search will include keywords related to childhood, adolescence, mental health issues (e.g., anxiety, stress, depression), and food consumption (e.g., *in natura* or minimally processed foods and ultra-processed foods ultra-processed foods), verified using MeSH terms. The systematic review will follow the PRISMA-2020 guidelines, employing the PECOS strategy, and will include quantitative observational and mixed-methods studies. A search will be conducted in the following databases: Scopus, CINAHL, SPORTDiscus, LILACS, Web of Science, APA-PsycArticles, PubMed/Medline, and EMBASE. Identifying the association between mental health and food consumption will contribute to the development of preventive and intervention strategies aimed at improving the health and well-being of children and adolescents. The analysis of the data will provide results on how psychological factors are linked to the consumption of various food groups, implying the updating of public policies. These guidelines can assist managers and researchers in creating effective interventions to promote mental health and healthy eating behaviors, ultimately leading to long-term positive impacts on public health.

Specifications table

This table provides general information on your protocol.

Subject area:	Psychology
More specific subject area:	Anxiety, Depression and Stress
Name of your protocol:	Food Consumption and Mental Health in Children and Adolescents: A Systematic Review Protocol
Reagents/tools:	None
Experimental design:	This study will evaluate the association between food consumption and mental health (anxiety, depression, stress) in children and adolescents through a systematic review and meta-analysis. The search will be carried out in eight databases, using the PECOS strategy and MeSH terms. Quantitative observational and mixed methods studies will be included. The analysis will follow the PRISMA 2020 guidelines, focusing on how mental health variables can be associated with food consumption characteristics, with an emphasis on markers of healthy and unhealthy eating, based on the concepts of the NOVA classification. This approach aims to avoid overlap with existing reviews and ensure an original research question, contributing to the development of preventive interventions.
Trial registration:	CRD42024581964
Ethics:	Ethical approval is unnecessary because this study analyses previously published articles (i.e., secondary data). The results will be published in a peer-reviewed journal.
Value of the Protocol:	1. This protocol serves as a basis for identifying the relationship between food consumption and the mental health of children and adolescents, enabling the development of targeted interventions that promote both healthy eating and mental well-being.
	2. By systematically analyzing existing research, the protocol contributes to the formulation of comprehensive public policies that address the challenges and associations between poor diet and mental health problems in younger populations.
	3. The protocol provides a clear and structured plan for conducting the systematic review, ensuring that the study follows standardized methods and reduces bias, increasing the reliability of the results.

Background

Mental health encompasses mental, emotional, social, and behavioral factors [1]. Anxiety, depression [2], and stress are the key components of this state [3]. Emerging evidence suggests a bidirectional relationship between mental health and eating habits, where psychological states influence food choices, and eating habits, in turn, affect psychological well-being [4]. Therefore, understanding this relationship is important to develop effective nutritional interventions that address mental health issues, especially in children and adolescents [5].

Food consumption patterns are closely tied to the frequency of intake of various food groups [6], including the groups of the NOVA classification. In this classification, foods are categorized into four main groups based on their level of processing: 1) *in natura* or minimally processed foods, 2) processed culinary ingredients, 3) processed foods, and 4) ultra-processed foods [7,8]. Alarmingly, ultra-processed foods are increasingly consumed by the younger population [9]. This category is an indicator of poor diet quality is positively associated with several health problems, including obesity and cardiovascular diseases [10].

A healthy diet, which emphasizes the consumption of healthier food groups [11], is essential for the development [12] and health of children and adolescents [13–15]. The evidence suggests that the eating habits established during childhood [16] can influence physical and mental health [17] and are important determinants of health [18]. Individuals who adhere to healthier food consumption patterns often report better health outcomes [19]. However, these habits are not shaped solely by individual choices; rather, they are strongly influenced by a complex interplay of biological, psychological [20], social, environmental [21], and familial factors [22–25], making it important to understand how specific factors — such as mental health — are linked with food consumption.

Indeed, current evidence has linked poor mental health, including stress [26], depressive symptoms [27], and anxiety, with poor diet quality [28], which is often characterized by high consumption of sugary foods and drinks [29]. These associations suggest that mental health influences food consumption, leading to long-term health problems, including obesity and other diet-related diseases [30]. However, despite these observed associations, the specific relationships between food consumption particularly the groups defined by the NOVA classification, and mental health outcomes are not fully understood [31,32].

Description of protocol

Although several studies have already explored the relationship between mental health and food consumption in children [33,34] and adolescents [35–42], a comprehensive synthesis of these findings through a systematic review with meta-analysis, specifically relating mental health with NOVA classification, is lacking [43–45] Therefore, to fill this gap, this protocol aims to evaluate [46] the associations between food consumption according to NOVA classification and mental health, in children and adolescents through a systematic review.

Method

Protocol and registration

This systematic review protocol complies with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Protocols 2015 (PRISMA-P 2015), which ensures transparent reporting of the review process; a checklist that assists in the writing

Table 1
Search strategy.

Search	Terms used
#1	(childhoods OR childhood OR child OR children OR adolescence OR adolescent OR adolescents OR teen OR teens OR teenager OR teenagers OR kid OR kids OR preteens OR preteen OR toddler OR toddlers OR minors OR minor OR youth OR youths OR juvenile OR schoolchild OR schoolchildren OR young OR "young people" OR student OR students)
#2	(anxiety OR stress OR depression OR "mental health" OR "psychological well-being" OR "mental well-being" OR "mental illnesses" OR "psychological problem" OR "psychological problems" OR "psychological health" OR "mental illness" OR "excessive worries" OR "excessive worry" OR "depressive symptoms" OR "depressive symptom" OR "depressive disorder" OR "depressed mood" OR "mood disorder")
#3	("eating habits" OR "eating habit" OR "eating behaviors" OR "eating behavior" OR "eating behaviours" OR "eating behaviour" OR "eating patterns" OR "eating pattern" OR "food frequency" OR "food group" OR "food groups" OR "food intakes" OR "food intake" OR "dietary habit" OR "dietary habits" OR "food choice" OR "food choices" OR "food habit" OR "food habits" OR "food consumptions" OR "food consumption" OR "dietary patterns" OR "dietary pattern" OR "dietary choice" OR "dietary choices" OR "dietary lifestyle" OR "dietary behaviors" OR "dietary behavior" OR "dietary behaviour" OR "dietary behaviours" OR "convenience food" OR "fast food" OR "highly-processed" OR "industrialized foods" OR "junk food" OR NOVA OR "nova classification" OR "NOVA food classification" OR "NOVA system" OR "prepared foods" OR "processed foods" OR "ready-to-consume" OR "ready-to-eat" OR "ultra processed" OR "ultra processed foods" OR "ultra-processed foods" OR "ultra-processed products" OR UPF)
#4	("case series" OR "case-control" OR cohort OR "correlational study" OR "cross-national" OR "cross-sectional" OR "demographic study" OR "descriptive study" OR "epidemiological follow-up" OR "epidemiological study" OR "follow-up study" OR "incidence follow-up" OR "incidence study" OR "interview-based follow-up" OR "interview-based study" OR "longitudinal follow-up" OR "longitudinal observational" OR "longitudinal study" OR "nationally-representative" OR "observational analysis" OR "observational data" OR "observational follow-up" OR "observational pilot" OR "observational study" OR "observational survey" OR "population-based" OR "prevalence study" OR "prospective follow-up" OR "prospective observational" OR "prospective study" OR "questionnaire-based follow-up" OR "questionnaire-based study" OR "registry-based follow-up" OR "registry-based study" OR "retrospective follow-up" OR "retrospective observational" OR "retrospective study" OR survey OR "time-series study")
#5	#1 AND #2 AND #3 AND #4

of systematic review protocols [33]. Furthermore, this protocol is registered on the PROSPERO (International Register of Prospective Systematic Reviews) platform (registration number: CRD42024581964) to ensure transparency. Any adjustments made to the methodology during the study will be documented in PROSPERO, as well as in the final manuscript [34]. The review will be reported according to the guidelines provided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [35]

Search strategy and databases

The PECOS (Population, Exposure, Comparison, Outcome, Study design) strategy was used to define the following research question: "How is food consumption associated with mental health in children and adolescents?" In this sense, population (P) refers to children and adolescents; exposure (E) refers to higher consumption of a specific food category; the comparator (C) represents lower consumption of the same food category; the result (O) refers to mental health, including anxiety, depression, and stress; and study design (S) with delimitation in observational studies. To avoid overlap with existing reviews and ensure an original research question, we will direct our search to studies that investigate how mental health variables can be associated with the characteristics of food consumption, focusing on healthy and unhealthy eating markers, on the basis of concepts from the NOVA classification [8]. The search strategy was based on the PECOS strategy, and Medical Subject Heading (MeSH) terms were used (Table 1).

The Boolean operator "OR" was used to group synonymous terms, organizing them into structured blocks, which will be connected by the Boolean operator "AND" during the searches (Table 1). The search strategy was adjusted to meet the specific requirements of each database. This included using quotation marks, besides singular and multiple terms to ensure result comprehensiveness. Database searches will be conducted using the title, abstract, and keyword fields. Specific adjustments can be made for each database to maximize the inclusion of relevant studies for analysis.

The search strategy will be applied to the following multidisciplinary databases: Cumulative Index to Nursing and Allied Health Literature (CINAHL), Latin American and Caribbean Health Sciences Literature (LILACS), PubMed - Medical Literature Analysis and Retrieval System Online (Medline), Scopus, Web of Science, SPORTDiscus, Excerpta Medica Database (Embase), and American Psychological Association - Articles (APA- PsycArticles). The search strategy and databases were chosen to identify the most studies on the topic. The searches will be conducted between January and February 2025; and they will be conducted without language or publication period restrictions, as recommended by the guidelines of the main systematic review organizations, such as the Cochrane and Campbell Collaboration [36–38].

Eligibility criteria

This systematic review will include quantitative and mixed-method studies if they comply with the established eligibility criteria.
Inclusion criteria:

- Original published and peer-reviewed studies.
- Studies that evaluate how mental health variables are associated with food consumption characteristics, focusing on markers of healthy and unhealthy eating, based on the NOVA classification.

- Studies that include children and adolescents aged 6–19 years, considering middle childhood [39] and the final age of adolescence [40].
- Quantitative or mixed studies: observational.

Exclusion criteria:

- Duplicate articles [41].
- Studies with a mixed methodological approach in which it was not possible to separate the quantitative data analyzed.
- Studies not available in full in the databases searched and those that could not be accessed even after two attempts to contact the authors.
- Articles written in restricted languages that cannot be translated properly [42]. This criterion will only be applied if translation possibilities are unsuccessful after i) seeking support from our international collaboration network, ii) employing artificial intelligence tools, and iii) contracting specialized companies for the necessary translations [43].
- Studies that simultaneously involve another population unless data are reported separately or can be calculated from the results provided.
- Studies including children and adolescents with mental disabilities or chronic illnesses in sampling.
- Studies focusing on dietary restriction for weight loss purposes.
- Studies on assessments and associations conducted exclusively in specific populations, such as rural, hospitalized, indigenous, refugee, and isolated groups.
- Studies that were previously retracted [44].

In addition, we will check the included studies for retraction using the Scite tool (https://scite.ai/home) [45]. If retracted records are identified, the article will be excluded from the study.

Screening process

After the searches, the identified metadata will be imported into the Rayyan software, which assists the screening process [46]. This first stage involves two independent reviewers (R1 and R2) reading titles and abstracts for selection based on eligibility criteria, besides removing duplicates, as illustrated in Fig. 1. The entire procedure is performed simultaneously and blindly. After the removal of the blinding, possible disagreements are resolved by a senior reviewer (MN). Articles meeting the inclusion criteria will be included in the systematic review. Cohen's kappa and percentage agreement coefficients will subsequently be calculated to assess inter-rater reliability and agreement, respectively [47–49].

Data extraction

After screening, two independent reviewers (R1 and R2) will extract, evaluate, and synthesize the quantitative data. Throughout this process, only articles that met the eligibility criteria will be included. Any discrepancies will be resolved by a third senior reviewer (R3 or R4). To extract the data (File 2 in the Supplementary Material), a standardized spreadsheet will be used to summarize and explain the characteristics and findings of the included studies.

Information will be extracted from the included studies, such as publication details (objective, authors, and year), context in which the study was conducted (country and population involved in the study), methodological design (study design, instrument used, sample size, and test used), variables studied, the outcomes identified through statistical analyses, and classification of the food under study, according to NOVA. Subsequently, the data can be classified into categories, grouped or simplified for better interpretation and presented through figures, diagrams or other graphic elements.

Bias risk assessment

The Downs and Black scale, which consists of 27 items, will be used to assess the risk of bias in quantitative studies [50]. A higher the final score indicates higher study quality and the lower a risk of bias. Each study's score will be calculated as a percentage of the total score [43,51]. Scores above 70 % will be considered "low risk of bias", while scores below 70 % will be "high risk of bias" [50,57,65].

As some items of this checklist are not applicable to observational study designs, a shorter version adapted from a previous study was used for the cross-sectional (0–12 points) and longitudinal (0–16 points) designs [51]. Therefore, a subset of 16 questions (corresponding to Questions 1–3, 5–7, 9–12, 17, 18, 20, 21, 25, and 26) was used [52]. Two independent reviewers (R1 and R2) evaluate methodological quality and bias risk. Any disagreements in the evaluation are resolved by a third senior reviewer (MN).

Data analysis

The effect size will be calculated and reported with 95 % confidence intervals, using a random effects model [53]. For sensitivity analysis, we will remove one study at a time to determine if any study could significantly modify the effect size [54]. Additionally, we will remove all studies classified as "high risk of bias" and run the analysis again to see if lower quality studies could influence the effect size.
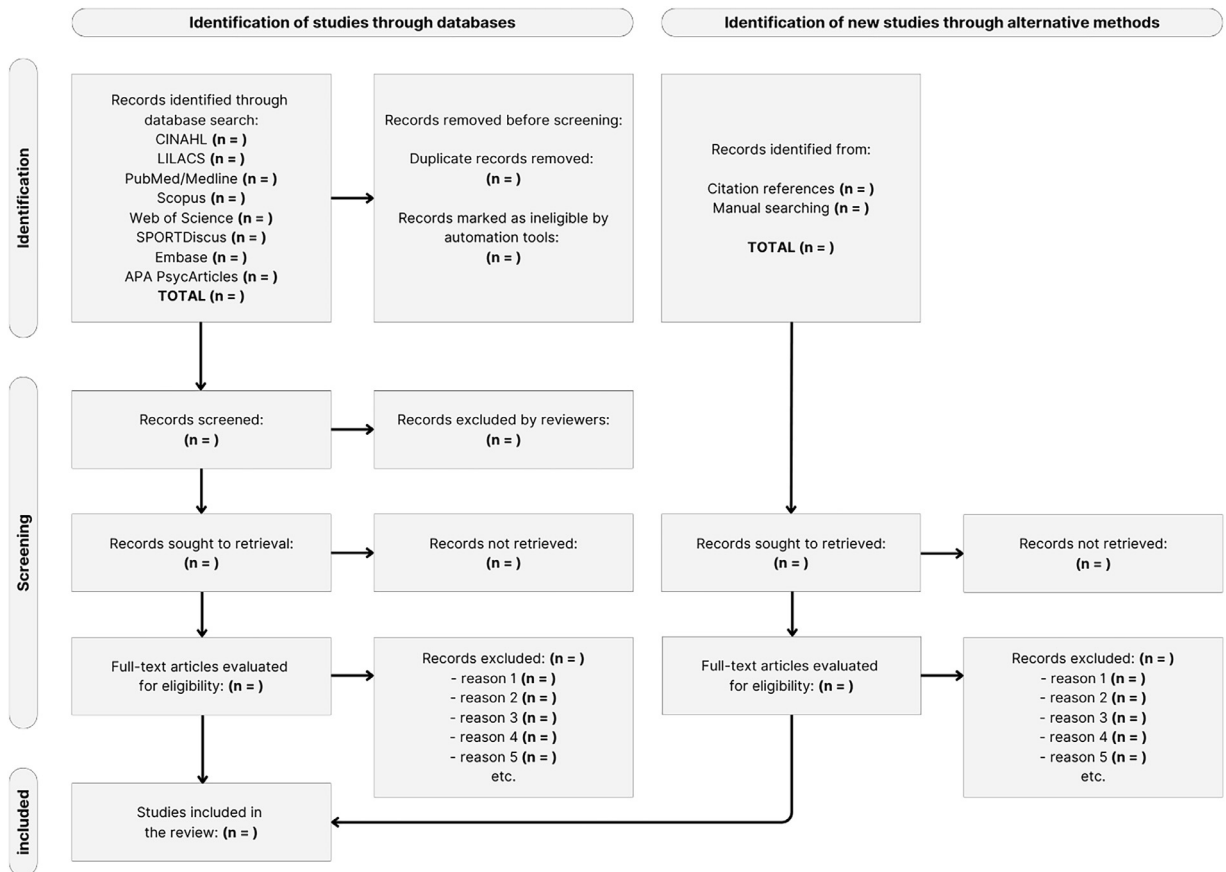
Fig. 1. PRISMA 2020 flowchart model for identifying, screening, and including studies in the review.

Statistical heterogeneity will be quantified by estimating I^2 [39,40], which expresses the proportion of heterogeneity [55]. The proportion can be classified as 0–25 % for "low," 25–50 % for "moderate" or >50 % for "high" heterogeneity. Additionally, we will use Cochran's Q test, with a value of $p < 0.05$ considered statistically significant for heterogeneity [56]. For the precision analysis, we will calculate the power of each meta-analysis.

Publication bias

To assess the potential for publication bias, we will first construct a funnel plot [57] and a scatterplot that relate effect sizes to studies' standard errors. First, the symmetry of the funnel chart will be visually examined. As this method is subjective, trim-and-fill analysis will also be used [58], along with the Egger regression test [59].

Assessment of evidence certainty

We will assess the certainty of the evidence for each meta-analyzed outcome using the Grading of Recommendations, Assessment, Development, and Evaluations (GRADE) recommendations [60]. The certainty of the evidence will be classified as "high", "moderate", "low" or "very low". Observational studies start with a low certainty of evidence but can be increased or decreased according to their suitability. Furthermore, we will consider the proportion of studies classified as high risk of bias (minus 1 level if 50–75 % are "low risk of bias; and minus 2 if <50 %), consistency (minus 1 level for "moderate heterogeneity"; and minus 2 for "high heterogeneity"), precision (minus 1 level if power is 80–90 %; and minus 2 if <80 %), generalizability of results (minus 1 level if generalizing to different populations) and publication bias (minus 1 level if $p \leq 0.05$ in Egger's test) [61,62]. The GRADEpro GDT software will be used to create the tables (https://www.gradepro.org/).

Reviewer training

To code the articles, an eligibility assessment will initially be conducted on 50 titles and abstracts, with reviewers being trained in the use of inclusion and exclusion criteria [63–65] using the Rayyan® software. Furthermore, the reviewers will undergo training on how to apply the instruments to assess the methodological quality and risk of bias.

Conclusions

This systematic review will be crucial for understanding the complex relationship between food consumption and mental health in children and adolescents. By consolidating data from multiple studies, we aim to provide robust evidence that will guide practical actions and public policies aimed at promoting the comprehensive health of this population. The review may identify significant gaps, such as the lack of research meeting eligibility criteria, which could encourage further investigations into the topic. Additionally, the heterogeneity of studies and contextual variables may hinder direct comparisons and introduce biases, underscoring the need for future research to address these issues and achieve a more comprehensive understanding of the subject.

Protocol validation

This systematic review protocol aims to measure the association between food consumption and the mental health of children and adolescents, a topic that is complex and multifaceted and is influenced by various psychological, physical, family, and social factors. A comprehensive understanding of the intricate relationship between mental health and dietary habits is crucial for informing the development of effective interventions aimed at promoting healthy eating practices. Such interventions must also incorporate considerations of mental health issues at both individual and population levels. Furthermore, the implementation of integrated strategies and the establishment of consistent public policies are vital for addressing contemporary nutritional challenges in a sustained and systematic manner [66,67]. This approach should encompass various stakeholders, including children, adolescents, parents or guardians, and educational institutions.

The significance of this topic cannot be overstated, as the health and well-being of children and adolescents are profoundly influenced by their growth and developmental trajectories [68]. According to the World Health Organization (WHO), mental health disorders impact a substantial proportion of individuals within this demographic, rendering them the leading cause of health-related disability globally [69]. During childhood and adolescence, individuals undergo critical periods of rapid physical and psychological development, which necessitate adequate nutritional intake. This underscores the imperative to thoroughly investigate the relationship between mental health and dietary behaviors, as understanding this connection is essential for fostering healthier lifestyles and improving overall well-being in younger populations [70].

Limitations

This protocol has several strengths that are worth highlighting. The search was performed using eight databases, without time or language restrictions. In addition to a broad search for various terms related to children, adolescents, mental health, and food consumption, we aimed to better identify and cover studies on the subject and subsequently analyze the association between the various variables studied. Additionally, we will assess the risk of bias in each study and the certainty of the evidence for each meta-analysis. The data will be extracted by two independently trained reviewers. The use of rigorous methods will ensures that conclusions are based on robust evidence. Finally, the study focuses on the population of children and adolescents, which has often been neglected [71].

The systematic review based on this protocol has some limitations. If none of the studies meet the eligibility criteria, the review will be reported as empty. However, this will still be useful, as it may motivate future studies. The heterogeneity of the included studies may make it difficult to directly compare the results. Different methods of assessing mental health and eating habits as well as contextual variables such as geographical location and socioeconomic status can lead to biases. Finally, studies with quantitative data may be underrepresented, limiting the full understanding of individual experiences.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

CRediT authorship contribution statement

Milka Barbosa Costa: Conceptualization, Methodology, Validation, Data curation, Writing – original draft, Writing – review & editing, Visualization, Supervision, Project administration. **Regina Márcia Ferreira Silva:** Validation, Writing – original draft, Writing – review & editing, Project administration. **Kaio Vinicius C Silva:** Conceptualization, Methodology, Data curation, Writing – original draft, Writing – review & editing, Project administration, Visualization. **Suelen Marçal Nogueira:** Conceptualization, Writing – original draft, Writing – review & editing, Visualization. **Lauryane Fonseca Terra:** Conceptualization, Writing – original draft. **Lavínia Leal Cordeiro:** Validation, Writing – original draft. **Emilio Villa-González:** Writing – review & editing. **Priscilla Rayanne E. Silva Noll:** Conceptualization, Writing – original draft, Supervision, Project administration. **Matias Noll:** Conceptualization, Methodology, Validation, Data curation, Writing – original draft, Writing – review & editing, Visualization, Supervision, Project administration.

Data availability

I have shared the link to my data at the attach file stop.

Acknowledgments

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.mex.2024.103015.

References

[1] R.H. Bitsko, A.H. Claussen, J. Lichstein, L.I. Black, S.E. Jones, M.L. Danielson, et al., Mental Health Surveillance Among Children — United States, 2013–2019, MMWR 71 (Suppl) (2022) 1–42, doi:10.15585/mmwr.su7102a1.

[2] X. Zhang, T. Lv, G. Leavey, N. Zhu, X. Li, Y. Li, et al., Does depression affect the association between prosocial behavior and anxiety? A cross-sectional study of students in China, Front. Public Health 11 (2023), doi:10.3389/fpubh.2023.1274253.

[3] O.N. Medvedev, Depression Anxiety Stress Scales (DASS-21) in International Contexts, in: International Handbook of Behavioral Health Assessment, Springer International Publishing, Cham, 2023, pp. 1–15, doi:10.1007/978-3-030-89738-3_15-1.

[4] J.D. Bremner, K. Moazzami, M.T. Wittbrodt, J.A. Nye, B.B. Lima, C.F. Gillespie, et al., Diet, stress and mental health, Nutrients. 12 (2020), doi:10.3390/nu12082428.

[5] L. Renwick, R. Pedley, I. Johnson, V. Bell, K. Lovell, P. Bee, et al., Conceptualisations of positive mental health and wellbeing among children and adolescents in low- and middle-income countries: a systematic review and narrative synthesis, Health Expect. 25 (2022) 61–79, doi:10.1111/hex.13407.

[6] M.L. Bradlee, M.R. Singer, M.M. Qureshi, L.L. Moore, Food group intake and central obesity among children and adolescents in the Third National Health and Nutrition Examination Survey (NHANES III), Public Health Nutr. 13 (2010) 797–805, doi:10.1017/S1368980009991546.

[7] R.R. Petrus, P.J. do Amaral Sobral, C.C. Tadini, C.B. Gonçalves, The NOVA classification system: a critical perspective in food science, Trends. Food Sci. Technol. 116 (2021) 603–608, doi:10.1016/j.tifs.2021.08.010.

[8] C.A. Monteiro, G. Cannon, R.B. Levy, J.-C. Moubarac, M.L. Louzada, F. Rauber, et al., Ultra-processed foods: what they are and how to identify them, Public Health Nutr. 22 (2019) 936–941, doi:10.1017/S1368980018003762.

[9] I. Huybrechts, F. Rauber, G. Nicolas, C. Casagrande, N. Kliemann, R. Wedekind, et al., Characterization of the degree of food processing in the European Prospective Investigation into Cancer and Nutrition: application of the Nova classification and validation using selected biomarkers of food processing, Front. Nutr. 9 (2022), doi:10.3389/fnut.2022.1035580.

[10] X. Chen, Z. Zhang, H. Yang, P. Qiu, H. Wang, F. Wang, et al., Consumption of ultra-processed foods and health outcomes: a systematic review of epidemiological studies, Nutr. J. 19 (2020) 86, doi:10.1186/s12937-020-00604-1.

[11] H. Tang, Y. Zhang, B. Cao, Y. Liang, R. Na, Z. Yang, et al., Knowledge, attitudes and behaviors toward healthy eating among Chinese cancer patients treated with chemotherapy: a systematic review, Asia Pac. J. Oncol. Nurs. 10 (2023) 100163, doi:10.1016/j.apjon.2022.100163.

[12] R. Kupka, K. Siekmans, T. Beal, The diets of children: overview of available data for children and adolescents, Glob. Food Sec. 27 (2020) 100442, doi:10.1016/j.gfs.2020.100442.

[13] C. Regan, H. Walltott, K. Kjellenberg, G. Nyberg, B. Helgadóttir, Investigation of the associations between diet quality and health-related quality of life in a sample of Swedish adolescents, Nutrients 14 (2022) 2489, doi:10.3390/nu14122489.

[14] A. Al-Jawaldeh, M. Taktouk, L Nasreddine, Food consumption patterns and nutrient intakes of children and adolescents in the eastern mediterranean region: a call for policy action, Nutrients. 12 (2020) 3345, doi:10.3390/nu12113345.

[15] S. Naveed, T. Lakka, E.A. Haapala, An overview on the associations between health behaviors and brain health in children and adolescents with special reference to diet quality, Int. J. Environ. Res. Public Health 17 (2020) 953, doi:10.3390/ijerph17030953.

[16] S. Issanchou, Habeat consortium, Determining factors and critical periods in the formation of eating habits: results from the Habeat project, Ann. Nutr. Metab. 70 (2017) 251–256, doi:10.1159/000471514.

[17] M. Yıldız, The relationship between eating habits and mental development in adolescents, J. Psychiatr. Nurs. (2023) 369–377, doi:10.14744/phd.2023.11298.

[18] E. Wirfält, I. Drake, P. Wallström, What do review papers conclude about food and dietary patterns? Food Nutr. Res. 57 (2013) 20523, doi:10.3402/fnr.v57i0.20523.

[19] A.F.J. Geraets, A. Heinz, The associations of dietary habits with health, well-being, and behavior in adolescents: a cluster analysis, Child Care Health Dev. 49 (2023) 497–507, doi:10.1111/cch.13064.

[20] E.R. Grimm, N.I. Steinle, Genetics of eating behavior: established and emerging concepts, Nutr. Rev. 69 (2011) 52–60, doi:10.1111/j.1753-4887.2010.00361.x.

[21] G. Sogari, C. Velez-Argumedo, M.I. Gómez, C. Mora, College students and eating habits: a study using an ecological model for healthy behavior, Nutrients 10 (2018), doi:10.3390/nu10121823.

[22] K.S.N. Liu, J.Y. Chen, M.Y.C. Ng, M.H.Y. Yeung, L.E. Bedford, C.L.K. Lam, How does the family influence adolescent eating habits in terms of knowledge, attitudes and practices? A global systematic review of qualitative studies, Nutrients 13 (2021) 3717, doi:10.3390/nu13113717.

[23] A.-S. Fismen, O.R.F. Smith, O. Samdal, A. Helleve, E. Haug, Associations between family structure and adolescents' food habits, Public Health Nutr. 25 (2022) 702–709, doi:10.1017/S1368980020004334.

[24] L. Mahmood, P. Flores-Barrantes, L.A. Moreno, Y. Manios, E.M. Gonzalez-Gil, The influence of parental dietary behaviors and practices on children's eating habits, Nutrients 13 (2021) 1138, doi:10.3390/nu13041138.

[25] A.M. Ziegler, C.M. Kasprzak, T.H. Mansouri, A.M. Gregory, R.A. Barich, L.A. Hatzinger, et al., An ecological perspective of food choice and eating autonomy among adolescents, Front. Psychol. 12 (2021), doi:10.3389/fpsyg.2021.654139.

[26] K. Khaled, V. Hundley, F. Tsofliou, The association between perceived stress and diet quality in women of childbearing age: a systematic review, Proc. Nutr. Soc. 79 (2020) E599, doi:10.1017/S0029665120005480.

[27] M.-J. Kim, J.E. Park, J.H. Park, Associations of healthy eating behavior with mental health and health-related quality of life: results from the Korean national representative survey, Nutrients 15 (2023), doi:10.3390/nu15245111.

[28] Isabella Caroline Santos, Déborah Cristina de Souza Marques, Joed Jacinto Ryal, Gabriela dos Santos Ross, Clara Fernanda Amaro Camilo, Lucas França Garcia, et al., Change in the motivation pattern of adolescents before and after participation in a multidisciplinary health promotion program, J. Human Growth Dev. 33 (2023) 478–486.

[29] E. Javadi Arjmand, M. Bemanian, J.H. Vold, J.C. Skogen, G.M. Sandal, E.K. Arnesen, et al., Emotional eating and changes in high-sugar food and drink consumption linked to psychological distress and worries: a cohort study from Norway, Nutrients. 15 (2023) 778, doi:10.3390/nu15030778.

[30] S. Mizia, A. Felińczak, D. Włodarek, M. Syrkiewicz-Świtała, Evaluation of eating habits and their impact on health among adolescents and young adults: a cross-sectional study, Int. J. Environ. Res. Public Health 18 (2021) 3996, doi:10.3390/ijerph18083996.

[31] C. Bui, Ll-Y Lin, C.-Y. Wu, Y.-W. Chiu, H.-Y. Chiou, Association between emotional eating and frequency of unhealthy food consumption among Taiwanese adolescents, Nutrients 13 (2021) 2739, doi:10.3390/nu13082739.

[32] C. Aoun, L. Nassar, S. Soumi, N. El Osta, T. Papazian, L.R. Khabbaz, The cognitive, behavioral, and emotional aspects of eating habits and association with impulsivity, chronotype, anxiety, and depression: a cross-sectional study, Front. Behav. Neurosci. 13 (2019), doi:10.3389/fnbeh.2019.00204.

[33] L.B. Sina, K. Nazemi, Visual analytics for systematic reviews according to PRISMA, in: 2022 26th International Conference Information Visualisation (IV), IEEE, 2022, pp. 307–313, doi:10.1109/IV56949.2022.00059.

[34] K. Kolaski, L.R. Logan, J.P.A. Ioannidis, Guidance to best tools and practices for systematic reviews, BMC. Infect. Dis. 23 (2023), doi:10.1186/s12879-023-08304-x.

[35] M.J. Page, J.E. McKenzie, P.M. Bossuyt, I. Boutron, T.C. Hoffmann, C.D. Mulrow, et al., The PRISMA 2020 statement: an updated guideline for reporting systematic reviews, Syst. Rev. 10 (2021) 89, doi:10.1186/s13643-021-01626-4.

[36] M.S. Cumpston, J.E. McKenzie, V.A. Welch, S.E. Brennan, Strengthening systematic reviews in public health: guidance in the *Cochrane Handbook for Systematic Reviews of Interventions*, 2nd edition, J. Public Health (Bangkok) 44 (2022) e588–e592, doi:10.1093/pubmed/fdac036.

[37] M. Cumpston, T. Li, M.J. Page, J. Chandler, V.A. Welch, J.P. Higgins, et al., Updated guidance for trusted systematic reviews: a new edition of the Cochrane Handbook for Systematic Reviews of Interventions, Cochrane Database of Systematic Reviews, 2019, doi:10.1002/14651858.ED000142.

[38] Campbell Collaboration Systematic Reviews: Policies and Guidelines. 2014. https://doi.org/10.4073/cpg.2016.1.

[39] K. Painter, M. Scannapieco, Overview of Child and Youth Development. Understanding the Mental Health Problems of Children and Adolescents, Oxford University Press, New York, 2021, doi:10.1093/oso/9780190927844.003.0003.

[40] World Health Organization. Mental health of adolescents 2021. https://www.who.int/news-room/fact-sheets/detail/adolescent-mental-health (accessed June 16, 2024).

[41] S. McKeown, Z.M. Mir, Considerations for conducting systematic reviews: evaluating the performance of different methods for de-duplicating references, Syst. Rev. 10 (2021) 38, doi:10.1186/s13643-021-01583-y.

[42] I. Pérez-Neri, C. Pineda, J.L. Flores-Guerrero, M.D. Estêvão, L.T. Vasanthan, S. Lorente, et al., Adherence to literature search reporting guidelines in leading rheumatology journals' systematic reviews: umbrella review protocol, Rheumatol. Int. 42 (2022) 2135–2140, doi:10.1007/s00296-022-05194-1.

[43] da Costa WP, Fernandes M da SV, A.R. Memon, P.R.E.S. Noll, M de M Sousa, M Noll, Factors influencing the work of researchers in Scientific Initiation: a systematic review protocol, PLoS One 19 (2024) e0297186, doi:10.1371/journal.pone.0297186.

[44] I. Pérez-Neri, C. Pineda, J.L. Flores-Guerrero, M.D. Estêvão, L.T. Vasanthan, S. Lorente, et al., Adherence to literature search reporting guidelines in leading rheumatology journals' systematic reviews: umbrella review protocol, Rheumatol. Int. 42 (2022) 2135–2140, doi:10.1007/s00296-022-05194-1.

[45] J.M. Nicholson, M. Mordaunt, P. Lopez, A. Uppala, D. Rosati, N.P. Rodrigues, et al., scite: A smart citation index that displays the context of citations and classifies their intent using deep learning, Quant. Sci. Stud. 2 (2021) 882–898, doi:10.1162/qss_a_00146.

[46] S.L.E. Roberts, A. Healey, N. Sevdalis, Use of health economic evaluation in the implementation and improvement science fields—A systematic literature review, Implement. Sci. 14 (2019) 72, doi:10.1186/s13012-019-0901-7.

[47] A. de Raadt, M.J. Warrens, R.J. Bosker, H.A.L. Kiers, A Comparison of reliability coefficients for ordinal rating scales, J. Classif. 38 (2021) 519–543, doi:10.1007/s00357-021-09386-5.

[48] G. Rau, Y.-S. Shih, Evaluation of Cohen's kappa and other measures of inter-rater agreement for genre analysis and other nominal data, J. Engl. Acad. Purp. 53 (2021) 101026, doi:10.1016/j.jeap.2021.101026.

[49] A. Vanacore, M.S. Pellegrino, Robustness of κ-type coefficients for clinical agreement, Stat. Med. 41 (2022) 1986–2004, doi:10.1002/sim.9341.

[50] S.H. Downs, N. Black, The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions, J. Epidemiol. Community Health (1978) 52 (1998) 377–384, doi:10.1136/jech.52.6.377.

[51] M. Noll, C.R. de Mendonça, L.P. de Souza Rosa, E.A. Silveira, Determinants of eating patterns and nutrient intake among adolescent athletes: a systematic review, Nutr. J. 16 (2017) 46, doi:10.1186/s12937-017-0267-0.

[52] R.M. Ferreira Silva, C.R. Mendonça, V.D. Azevedo, A. Raoof Memon, P.R.E.S. Noll, M Noll, Barriers to high school and university students' physical activity: a systematic review, PLoS One 17 (2022) e0265913, doi:10.1371/journal.pone.0265913.

[53] J.R. Dettori, D.C. Norvell, J.R. Chapman, Fixed-effect vs random-effects models for meta-analysis: 3 points to consider, Global Spine J. 12 (2022) 1624–1626, doi:10.1177/21925682221110527.

[54] K.V.C. Silva, B.D. Costa, A.C. Gomes, B. Saunders, J.F. Mota, Factors that moderate the effect of nitrate ingestion on exercise performance in adults: a Systematic review with meta-analyses and meta-regressions, Adv. Nutr. 13 (2022) 1866–1881, doi:10.1093/advances/nmac054.

[55] F. Barili, A. Parolari, P.A. Kappetein, N. Freemantle, Statistical primer: heterogeneity, random- or fixed-effects model analyses? Interact. Cardiovasc. Thorac. Surg. 27 (2018) 317–321, doi:10.1093/icvts/ivy163.

[56] J.P.T. Higgins, S.G. Thompson, J.J. Deeks, D.G. Altman, Measuring inconsistency in meta-analyses, BMJ 327 (2003) 557–560, doi:10.1136/bmj.327.7414.557.

[57] G.B.O. Rosendo, J.C. Padovam, R.L.U. Ferreira, A.G. Oliveira, F. Barbosa, L.F.C. Pedrosa, Assessing the impact of arsenic, lead, mercury, and cadmium exposure on glycemic and lipid profile markers: a systematic review and meta-analysis protocol, MethodsX 12 (2024) 102752, doi:10.1016/j.mex.2024.102752.

[58] S. Duval, R. Tweedie, Trim and fill: a simple funnel-plot-based method of testing and adjusting for publication bias in meta-analysis, Biometrics 56 (2000) 455–463, doi:10.1111/j.0006-341x.2000.00455.x.

[59] M. Egger, G. Davey Smith, M. Schneider, C Minder, Bias in meta-analysis detected by a simple, graphical test, BMJ 315 (1997) 629–634, doi:10.1136/bmj.315.7109.629.

[60] L. Zeng, R. Brignardello-Petersen, G. Guyatt, When applying GRADE, how do we decide the target of certainty of evidence rating? Evid. Based Mental Health 24 (2021) 121–123, doi:10.1136/ebmental-2020-300170.

[61] R.A. Mustafa, N. Santesso, J. Brozek, E.A. Akl, S.D. Walter, G. Norman, et al., The GRADE approach is reproducible in assessing the quality of evidence of quantitative evidence syntheses, J. Clin. Epidemiol. 66 (2013) 736–742, doi:10.1016/j.jclinepi.2013.02.004.

[62] Schünemann H., Brożek J., Guyatt G., Oxman A. GRADE Handbook 2013. https://gdt.gradepro.org/app/handbook/handbook.html (accessed 5 August 2024).

[63] M da SV Fernandes, C.R. Mendonça, T.M.V. da Silva, M Noll, The relationship between depression and quality of life in students and the academic consequences: protocol for a systematic review with meta-analysis, Int. J. Educ. Res. 109 (2021) 101812, doi:10.1016/j.ijer.2021.101812.

[64] B. Ferreira A de, S. Filho RR da, L.P. Rodrigues, G.V. de Souza, M. Noll, E.A Silveira, Association between sarcopenia and hospitalization in community-dwelling older adults, using the SARC-F and SARC-CalF methods: a systematic review protocol, Phys. Ther. Rev. 26 (2021) 391–397, doi:10.1080/10833196.2021.1917843.

[65] M. Noll, N. Wedderkopp, C.R. Mendonça, P. Kjaer, Motor performance and back pain in children and adolescents: a systematic review and meta-analysis protocol, Syst. Rev. 9 (2020) 212, doi:10.1186/s13643-020-01468-6.

[66] C.B.C. Diniz, A.A. Feitosa, B.L.M. Coutinho, S.C. Gomes, A.L. Sant'anna, Araújo AF de, et al., Adolescent nutrition monitoring the Health Program in School, J. Human Growth Dev. 30 (2020) 32–39, doi:10.7322/jhgd.v30.9961.

[67] M. Cattafesta, L. Bresciani Salaroli, Beyond ultra-processed foods: the new direction of the basic food basket in Brazil, J. Human Growth Dev. 34 (2024) 06–10, doi:10.36311/jhgd.v34.15748.

[68] M.D. Ashurova, Makhamatov USh, K.M. Saydullaeva, A.L. Valiyev, F.I. Isroilov, Determining the health of children and adolescents, BIO Web Conf. 65 (2023) 05029, doi:10.1051/bioconf/20236505029.

[69] H.-L. Chiang, Y.-F. Chuang, Y.-A. Chen, C.-T. Hsu, C.-C. Ho, H.-T. Hsu, et al., Physical fitness and risk of mental disorders in children and adolescents, JAMA Pediatr. 178 (2024) 595, doi:10.1001/jamapediatrics.2024.0806.

[70] S. Awasthi, D. Kumar, S. Singh, S. Dixit, G. Agarwal, A.A. Mahdi, Prevalence of specific micronutrient deficiencies in urban school going children of India aged between 6 and 16 years: study protocol for a multicentric cross-sectional study, BMJ Open 11 (2021) e046783, doi:10.1136/bmjopen-2020-046783.

[71] D. Hill, M. Conner, F. Clancy, R. Moss, S. Wilding, M. Bristow, et al., Stress and eating behaviours in healthy adults: a systematic review and meta-analysis, Health Psychol. Rev. 16 (2022) 280–304, doi:10.1080/17437199.2021.1923406.