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Autonomy at the table: the role of food parenting practices in children's fruit and vegetable consumption – a systematic review and meta-analysis protocol

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ABSTRACT

Introduction Despite parents' efforts, many children have nutrient-poor diets with insufficient fruit and vegetable consumption. Parents significantly influence children's eating habits at home through their food parenting practices. Although previous systematic reviews have explored food parenting practices, they were conducted some time ago. Therefore, it is timely to investigate the relationship between autonomy-supportive practices and fruit/vegetable consumption in children aged 2 to 12.

Methods and analysis The systematic review and meta-analysis protocol will be conducted by Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols guidelines. The databases PubMed, Scopus, Web of Science, PsycINFO, EMBASE, LILACS and Google Scholar will be searched with no restrictions on publication year, country or language. In addition to the databases, the search will be supplemented by manual searches of reference lists from the included articles. Studies that assess at least one parental autonomy-supportive food practice and its relationship with fruit and vegetable consumption in healthy children aged 2 to 12 years will be included. Results will be organised in tables and figures. A meta-analysis will be conducted if data availability permits. Risk of bias will be assessed using Joanna Briggs Institute tools. All steps will be conducted independently by two reviewers.

Ethics and dissemination Findings from this review will be important for understanding the influence of parental autonomy-supportive food practices on children's fruit and vegetable consumption, potentially informing health practices that promote healthy eating habits from childhood. No ethical approval is required for this review, and we plan to publish the findings in a peer-reviewed journal.

PROSPERO registration number CRD42023442680.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The review will be conducted rigorously and transparently with a systematic review specialist.
⇒ A rigorous bias risk assessment will be incorporated using tools from the Joanna Briggs Institute.
⇒ The review will focus on identifying practices that may promote fruit and vegetable consumption.
⇒ Self-reported tools used in the included studies may introduce social desirability bias.
⇒ Studies conducted in Western populations may limit the generalisation of results to other cultures.

INTRODUCTION

Despite parents' and families' efforts to provide adequate and healthy nutrition, many children still have nutrient-poor diets.[1] In 2019, according to the report The State of the World's Children[2], two out of five children did not consume fruits or vegetables, thus missing out on the essential nutritional benefits of these foods. At the same time, the consumption of processed snacks and beverages among young children is high, contributing to the early development of overweight and obesity.[2]

Fruits and vegetables are nutrient-rich foods that provide vitamins, minerals, dietary fibres and antioxidants. They should be introduced early in a child's diet and offered regularly.[1] The WHO recommends a daily intake of 400 grams (five servings) of fruits and vegetables to promote adequate health.[3] A diverse diet supports healthy growth and development throughout life and reduces the risk of non-communicable chronic diseases, contributing to lower mortality rates from these conditions.[3 4]

The home environment is fundamental to a child's physical, cognitive, social and emotional development.[5 6] Particularly, in the context of nutrition, parents significantly influence the formation of eating habits and

preferences through their actions and behaviours. In the scientific literature, these behaviours are referred to as food parenting practices. Food parental practices encompass the behaviours and actions, whether intentional or not, that parents engage in within the realm of feeding their children, with the aim of shaping their attitudes, behaviours and beliefs.[7]

According to the model proposed by Vaughn *et al*[7] and aligned with self-determination theory,[8] food parenting practices are divided into three main categories: coercive control, structure and autonomy support. Coercive control practices in the context of feeding include pressure to eat, food restriction, threats and bribes and using rewards to influence children's behaviour. The structure involves organising the food environment, setting and communicating clear and consistent rules, meal setup and family eating habits. The autonomy support involves nutritional education, child involvement in food acquisition and preparation, encouragement, praise, reasoning and negotiation.[7]

Studies have shown that structure and autonomy-support practices are associated with positive outcomes in children's health, while coercive control practices are linked to negative consequences. However, the study results were heterogeneous or sometimes did not reach statistical significance.[7 9 10] Three reviews published between 2016 and 2017 suggested that this inconsistency may be attributed to the fact that contextual variables (eg, parenting style and family structure) and individual factors (eg, temperament and eating behaviour) are not uniformly controlled across studies or to the lack of clarity in the definitions used to describe parental practices.[7 9 10]

Although some systematic reviews have investigated the relationship between food parenting practices and children's eating habits,[9 10] these reviews were published some time ago and primarily focused on coercive control and structure practices. There has been growing interest in studying food parenting practices in recent years. In this regard, there remains a gap in the literature, particularly concerning the investigation of the relationship between autonomy-supportive feeding practices and children's eating habits. This systematic review and meta-analysis aims to fill this gap by examining and synthesising the available evidence on the relationship between autonomy-supportive food parenting practices, as defined by the model proposed by Vaughn *et al*,[7] and fruit and vegetable consumption in children aged 2 to 12 years. Herein, we present the study protocol.

MATERIALS AND METHODS

Protocol and registration

This review and meta-analysis protocol was developed following the guidelines of the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols 2015[11 12] (online supplemental table 1). To ensure transparency and reproducibility and to avoid duplicating efforts on the same research topic, the protocol was submitted and registered with the International Prospective Register of Systematic Reviews (PROSPERO) under registration number CRD42023442680. Any changes to this protocol during the study will be updated in the PROSPERO registry and described in the final manuscript.

Information sources and search strategy

The Population, Intervention or Exposure, Comparison, Outcomes and Study Design[13] (table 1) was used to formulate the research question: 'Is there a relationship between autonomy-supportive parental feeding practices and fruit and vegetable consumption in children aged two to twelve years?' This age range was chosen to align with the definition of children as outlined in Job *et al*.[14] Furthermore, studies examining food parenting practices among child caregivers often cover a broad age range, including early and middle childhood, which can make it challenging to distinguish clearly between age groups. This review will focus on children, as this is the period when the home environment strongly influences the formation of eating habits, shaping children's attitudes and perceptions of food.

The following databases will be consulted to identify relevant studies: PubMed (National Library of Medicine), Scopus (Elsevier), Web of Science Core Collection (Clarivate Analytics), PsycINFO (American Psychological Association), EMBASE (Elsevier) and LILACS (BIREME). A limited search of the first 100 records will also be conducted in Google Scholar. Searches in PubMed will cover all fields, while searches in the other databases will be performed on titles, abstracts and keywords. Secondary searches will include reviewing the reference lists of included studies and relevant systematic reviews. Additionally, if information is lacking, the authors of the articles will be contacted.

Indexed terms and their synonyms were used to identify all relevant articles with boolean operators. The 'OR' operator combined similar terms, broadening the scope of each search strategy. The blocks of terms were then combined using the 'AND' operator. Searches were conducted in the databases without restrictions on year, country or publication language. Following the recommendations of Greenhalgh and Peacock,[15] systematic review team experts were consulted to refine the search strategy. Table 2 details the structure of the overall search strategy, including the descriptors and boolean operators used in the databases. Specific search strategies for each database can be found in online supplemental table 2. All studies meeting this review's eligibility criteria (table 1) will be included. The review will start in May 2023 and is expected to be completed in May 2025.

Eligibility criteria

The eligibility criteria are detailed in table 1, with no restrictions on publication year, country or language. All included articles will be checked for possible retractions. Eligible studies for the systematic review will be rigorously examined, including the use of Scite—an acronym

Table 1 PICOS criteria for study inclusion

Parameter	Inclusion criteria	Exclusion criteria
Population	Caregivers or primary guardians of healthy children aged 2 to 12 years.	Caregivers of children with conditions that may affect feeding (eg, coeliac disease, food allergies, food intolerances, autism spectrum disorder, Down syndrome and diabetes).
Exposure or Intervention	Evaluated at least one parental autonomy-supportive feeding practice and used validated instruments or tools with verified internal consistency of items. Patterns or profiles that only included autonomy-supportive practices will be included in this review.	Studies that used statistical approaches to combine parental practices from multiple domains into a single variable, that is, evaluating patterns/profiles of parental practices.
Comparison	Not applicable.	Not applicable.
Outcome	Evaluated fruit and/or vegetable consumption through dietary frequency questionnaires, food diaries and/or direct food weighing, or assessed preferences for these foods.	Evaluated combined fruit and vegetable consumption within a single dependent variable category or assessed fruits and vegetables as separate measures. Studies that combined fruit and vegetable consumption with other types of foods.
Study Type	Observational studies (cross-sectional, cohort, case-control). Intervention studies (randomised clinical trials and experimental studies).	Studies with missing and/or unclear data, even after requesting information from authors, letters, reviews, conference abstracts, opinion pieces, case reports, poster presentations, news summaries, theses and dissertations.

for 'Smart Citation Index', available online (https://scite.ai/)—to confirm the validity of the evidence and identify any retraction records. Scite is a research tool that offers an innovative way to verify, assess and contextualise citations of scientific articles. Among its various features, Scite checks if a specific article has been retracted or contested, thus ensuring the integrity of the sources used.[16]

Study selection process

The identified articles will be selected, and their metadata will be transferred to Zotero 6.0 (Corporation for Digital Scholarship, VA, Fairfax) in Research Information Systems (RIS) format, where duplicates will be identified and removed. The metadata will then be imported into Rayyan (available online at https://www.rayyan.ai/),[17] a software specifically designed for systematic

Table 2 Keywords used in the search strategy grouped into blocks

Block (PICO)	
# 1 P	(1) child OR children OR preschool OR "child, preschool" OR "children, preschool" OR "preschool child" OR "preschool children" OR "preschool-aged child" OR preschoolers
# 2 E/I	(2) parenting OR "child rearing" OR "food parenting" OR "parenting practices" OR "parental feeding practice" OR "parental feeding practices" OR "parenting feeding practices" OR "parent feeding practice" OR "parent feeding practices" OR "parents feeding practices" OR "maternal feeding practices" OR "food parenting practice" OR "food parenting practices" OR "parenting child-feeding practices" OR "parental child-feeding practices" OR "parental feeding behaviour" OR "parental feeding behaviours" OR "parental feeding behavior" OR "parental feeding behaviors" OR "feeding strategy" OR "feeding strategies" OR "parental feeding style" OR "parental feeding styles" OR "family feeding practices" OR "rearing child" OR "autonomy support" OR "autonomy promotion"
# 3 O	(3) eating OR "food preferences" OR fruit OR vegetables OR "food intake" OR "dietary intake" OR "dietary intakes" OR "eating habits" OR "food preference" OR "healthy food" OR "healthy eating" OR "healthy intake" OR "food consumption" OR fruits OR vegetable
Search Strategy	(#1) AND (#2) AND (#3)

E/I, Exposure or Intervention; O, Outcome; P, Population.

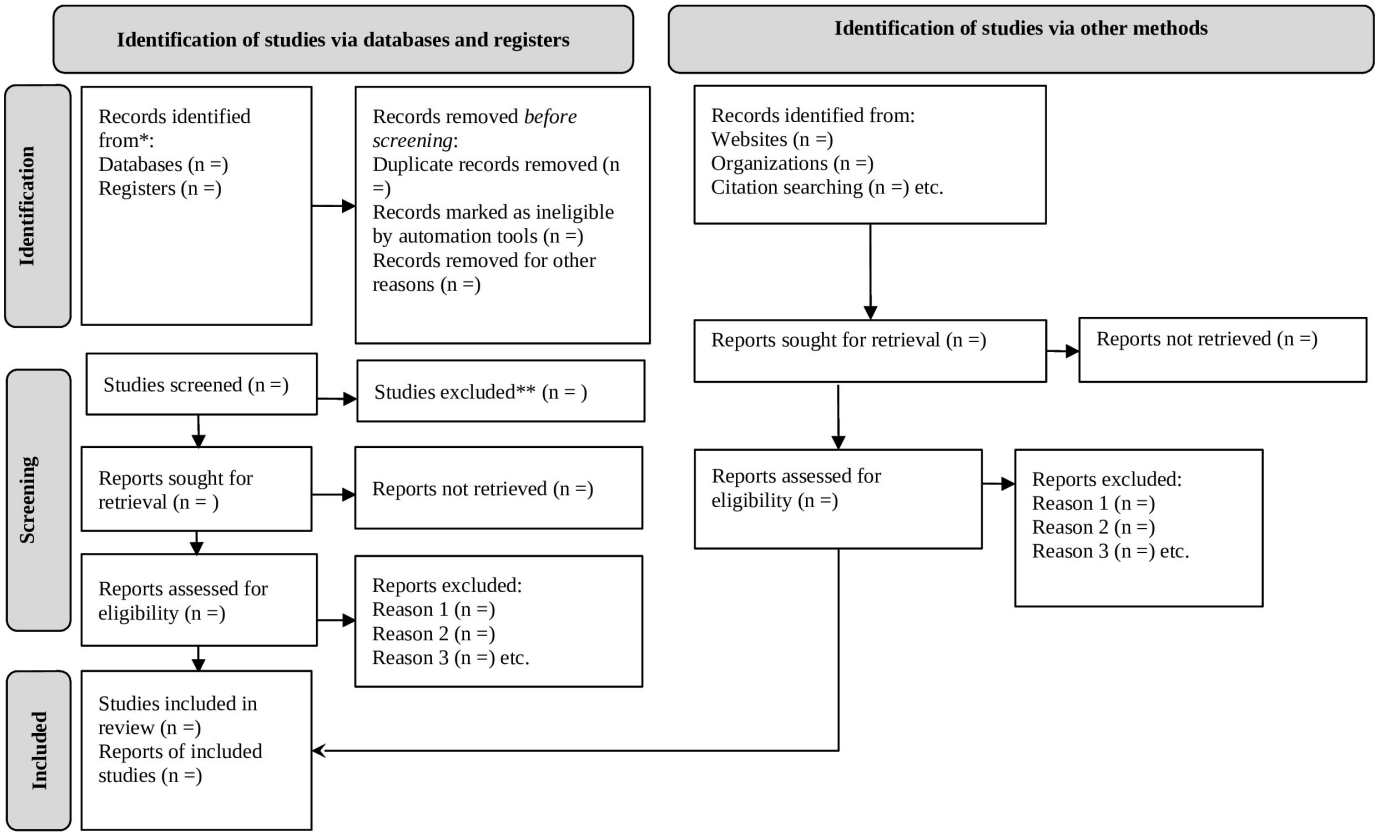

Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 flow diagram for the identification, screening and inclusion of studies in the review. *Consider, if feasible to do so, reporting the number of records identified from each database or register searched (rather than the total number across all databases/registers). **If automation tools were used, indicate how many records were excluded by a human and how many were excluded by automation tools. Source: Page MJ, et al. BMJ 2021;372:n71. doi: 10.1136/bmj.n71. This work is licensed under CC BY 4.0. To view a copy of this licence, visit https://creativecommons.org/licenses/by/4.0/.

reviews, with the reviewer blinding feature enabled for evaluation.

In Rayyan, the initial screening and selection of studies will be conducted by reading titles and abstracts to check compliance with inclusion criteria. Two independent reviewers (ECL and PRV) will perform this screening. A third researcher (PRM) will resolve any discrepancies between reviewers. In the subsequent phase, the same two reviewers will read the full text of the remaining articles to confirm eligibility. Discrepancies between reviewers during this phase will also be resolved by the third reviewer (PRM). Finally, articles deemed eligible will be included in this systematic review. The flowchart of the study selection process for this review is illustrated in figure 1, using a model recommended by Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2020.

Conducting the review with independent reviewers and blinding is crucial to minimise the likelihood of individual biases that may influence the review results. This increases the impartiality and objectivity of the analysis. Additionally, using independent and parallel reviewers allows for comparing assessments made by different reviewers. In this regard, reliability (Cohen's kappa coefficient, denoted as κ) and agreement (agreement ratio) between reviewers will be measured, increasing confidence in the results obtained, using R software V.4.3.3 (R Foundation, Vienna, Austria). The κ coefficient ranges from −1 to 1, reflecting different levels of agreement between reviewers. A value of $0<\kappa\leq0.20$ indicates no agreement, $0.21<\kappa\leq0.39$ indicates minimal agreement, $0.40<\kappa\leq0.59$ indicates weak agreement, $0.60<\kappa\leq0.79$ indicates moderate agreement, $0.80<\kappa\leq0.90$ indicates strong agreement and ≥0.90 indicates almost perfect agreement.[18]

Data extraction, synthesis and analysis

Data will be extracted, assessed and synthesised independently and blindly by the same two reviewers (ECL and PRV). Any discrepancies will be resolved by the third reviewer (PRM), if necessary. An extraction spreadsheet has been developed with the support of experts from the team, and it includes information such as publication details (authors, year, country), study type, participant characteristics (age, sex, sample size), autonomy-supportive practices evaluated, instruments used, methods of dietary intake assessment, confounding variables and key results (online supplemental table 3).

In addition to the aforementioned descriptive synthesis, this review will consider performing a quantitative synthesis through meta-analysis if the quantitative data from our investigation allow for it. Regression

coefficients and Pearson and Spearman correlation coefficients, as available in the included studies, will be used to estimate the association between parental feeding practices and children's fruit and vegetable consumption. The meta-analysis will calculate the weighted average of the regression and correlation coefficients to estimate the association's average effect, considering each study's sample weight.

Statistical methods will be applied to assess the heterogeneity among studies, using the I^2 statistic to quantify variability among study results and categorise heterogeneity as mild (25%–50%), moderate (50%–75%) or severe (>75%).[19] The analysis will be conducted with a 95% CI. Additionally, if two or more studies report results or information on the same data, the study with the largest number of participants will be considered.

To explore potential variations in the effects, subgroup analyses will be conducted, stratifying the studies by country of origin, children's age group, reporting perspective (whether reported by parents or children), method of parental feeding practice assessment and dietary intake assessment.[16] Additionally, a sensitivity analysis will be performed to evaluate the robustness of the results, considering the influence of potential sources of bias and variability in the data. The results will be objectively categorised and, if necessary, subcategorised. These findings will be presented clearly and concisely through figures, diagrams or other appropriate graphical elements to illustrate patterns, trends and outcomes.[20]

In addition to the aforementioned statistical analyses, a funnel plot will be used to assess publication bias among the included studies. This plot is useful for visualising the distribution of studies according to effect size and precision. Asymmetry in the funnel plot may indicate publication bias, where studies with positive or significant results are more likely to be published compared with studies with negative or non-significant results.[21] All statistical analyses will be conducted in R Studio V.4.3.4 (RStudio, Boston, MA), using two-sided p values.

Methodological quality assessment

The same two reviewers mentioned previously (ECL and PRV) will assess the risk of bias in eligible articles using the Joanna Briggs Institute tools according to the relevant study types (Joanna Briggs Institute, 2022, available at https://jbi.global/critical-appraisal-tools).[22] Each article will be evaluated using the corresponding checklist, with responses categorised as 'Yes' if the criterion is met, 'No' if not met, 'Unclear' if the information is not clear in the article and 'NA' if not applicable. In case of disagreements, the third reviewer (PRM) will be consulted to resolve discrepancies. The risk of bias will be determined based on a recent systematic review that also used the Joanna Briggs Institute checklists.[23] The articles will be classified into three levels of risk of bias: high, when the proportion of "yes" responses is less than 70%; moderate, when the proportion is between 70% and 89%; and low, when it is equal to or greater than 90%.[23]

Reviewer training

Reviewers assessing study eligibility will undergo training on inclusion and exclusion criteria, with the training conducted by the author specialising in systematic review (GMdA). They will also receive training on bias risk assessment tools and data extraction spreadsheets. Moreover, the training process covered how to correctly use the Rayyan software and standardise procedures too.

Ethics and dissemination

Ethical approval is not required for this type of study. The results will be submitted for publication in a peer-reviewed journal.

DISCUSSION

Food plays a fundamental role in a child's life from the earliest moments.[24] In the intrauterine environment, the food environment already significantly influences the individual's development through early exposure to smells and flavours, which can impact the child's food preferences.[25] However, the influence of food goes beyond this. Ecological models recognise that multiple factors shape the development of eating habits and preferences.[24] These factors range from proximal contextual aspects, such as food parenting practices, to more distal influences, including external factors beyond the family environment, such as school, peers and access to food outside the home.[24]

It is important to highlight that these factors do not act in isolation but interact. In this sense, family demographic characteristics such as race, ethnicity, education level, income and food security can influence the food practices parents adopt, which, in turn, impact children's food preferences and consumption.[7] This review not only aims to assess the relationship between food parenting practices, particularly autonomy-supportive ones, and children's fruit and vegetable consumption but also to explore what these factors have been addressed in existing studies.

Regarding food parenting practices, scientific literature has shown that non-responsive parenting practices negatively affect children's health.[7] These practices involve parents not adequately responding to their children's hunger and satiety cues.[26] Strategies such as pressuring children to eat and to clean their plates or imposing food restrictions can lead to negative relationships with food, resulting in reduced acceptance of healthy foods, increased preference for restricted foods and the potential development of disordered eating patterns.[7] Food restriction is associated with higher body mass index (BMI), while pressure to eat is associated with lower BMI, particularly in cross-sectional studies.[27]

On the other hand, responsive feeding practices, such as autonomy-supportive practices where parents appropriately and positively respond to children's hunger and satiety cues, have been associated with more favourable outcomes.[7 26] According to Vaughn *et al*,[7] these

autonomy-supportive practices include various strategies that encourage children's self-determination. For example, involving children in meal preparation is one such practice, allowing them to learn about food and to develop cooking skills early. Encouraging the exploration of new foods, such as fruits and vegetables, and teaching nutrition according to the child's age help increase their awareness about the importance of balanced eating. Additionally, praising children for making healthy food choices reinforces positive behaviours.

However, scientific literature shows some inconsistencies in results, which may be attributed to contextual (eg, family structure and parenting style) and individual variations (eg, temperament and eating behaviour) that are not adequately controlled.[7 10] Moreover, some studies lack clarity in defining food parenting practices, which may contribute to these discrepancies. Standardising these definitions would aid in comparing results across different studies and in formulating more effective strategies for promoting healthy eating habits among children.[7]

Strengths and limitations

This systematic review protocol has several strengths. First, the future review, conducted with rigour and transparency, is expected to identify gaps in the existing literature, encouraging further research to deepen the understanding of parental feeding practices and their impact on child health. By investigating the relationship between parental feeding practices and children's consumption, the review may promote healthy eating habits from an early age, with potential long-term effects on an individual's life. Additionally, the results may identify more effective food parenting practices for encouraging fruit and vegetable consumption, providing important evidence to guide healthcare professionals and child caregivers. The findings may support the development of programmes and interventions that promote feeding practices that are more responsive to children's needs. The subgroup analysis is likely feasible, as it enhances the understanding of result consistency and the factors influencing the findings, such as contextual and methodological differences between studies. Finally, the review may be relevant for informing public policies and health programmes to improve child health.

However, some limitations are expected. First, the tools used to assess parental practices and food consumption are often self-reported, which increases the likelihood of social desirability bias. Second, most studies may be cross-sectional, preventing causal inferences between variables. Thirdly, heterogeneity in the definitions and methodologies of the included studies may complicate the comparison and synthesis of results. Fourthly, as observed in other reviews,[9 10] most studies on parental feeding practices are limited to Western populations. Since culture can influence parent-child relationships, the findings may not be generalised to other cultures. Finally, as the aim of this review is to conduct a meta-analysis, subgroup analysis may provide important insights into contextual and methodological variations, allowing for a more robust interpretation of the findings.

CONCLUSION

The results of this review may encourage future research on the influence of autonomy-supportive food parenting practices on children's food consumption. Furthermore, understanding the factors influencing food consumption and preferences can help refine public policies and health interventions to promote healthy eating habits from childhood. Ultimately, the benefits of healthy eating can be more effectively expanded when there is active involvement from parents, caregivers and health professionals.

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Contributors ECL and PRV are mainly responsible for the protocol writing. GMdA, MN and KAM are mainly responsible for the design and revision of the protocol. ECL and PRV will be mainly responsible for study selection. ECL and PRV will be mainly responsible for charting data. ECL, PRV and PRM will be responsible for reporting results. ECL, PRV and PRM will be responsible for the discussion. KAM is responsible for the guidance of the whole study and is the guarantor. All authors contributed to the article and approved the submitted version. The AI technologies used were ChatGPT and Grammarly. These AI tools were employed to detect writing errors, cohesion issues and grammar problems, aiming to improve the text's clarity and flow. The AI tools were used to review the manuscript, identifying grammatical errors and issues of cohesion. The goal was to ensure that the text was clear and cohesive. Input: The manuscript text was provided as input to the AI tools. Output: The tools provided suggestions for grammatical corrections, cohesion adjustments and improvements to sentence structure, which were reviewed by the authors.

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