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Association of fifteen common dietary factors with tinnitus: a systematic review and meta-analysis of observational studies

Journal:	BMJ Open
Manuscript ID	bmjopen-2024-091507
Article Type:	Original research
Date Submitted by the Author:	23-Jul-2024
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Keywords:	OTOLARYNGOLOGY, NUTRITION & DIETETICS, Meta-Analysis, Neurotology < OTOLARYNGOLOGY

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1	Association	of fifteen	common	dietary	factors	with

- tinnitus: a systematic review and meta-analysis of
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- 21 Abstract

22 Objective: A systematic analysis was conducted to investigate the

 association between tinnitus prevalence and daily dietary patterns.

Methods: The PubMed, Embase, Web of Science, and Cochrane Library databases underwent searches from their inception to May 25, 2024. Two evaluators, blinded to the studies, chose observational studies from peerreviewed English-language journals. These studies examined tinnitus presence or severity in adults aged 18 or older, including associated prevalence estimates. Data extraction was independently conducted by two assessed research bias using the Agency for evaluators, who Newcastle-Ottawa Scale (NOS) and applied evidence classification criteria for aggregate grade strength assessment. This study adhered to the guidelines of the Preferred Reporting Project (PRISMA) and Meta-Analysis of Epidemiological Observational Studies (MOOSE), as well as the PROSPERO Registry protocols. A mixed-effects model combined maximum adjusted estimates, with heterogeneity measured using the I² statistic. Sensitivity analysis validated the analysis's robustness, while publication bias was assessed qualitatively and quantitatively. **Results:** A total of 10 retrospective studies were identified and included in this analysis, with the last eight studies incorporated into the meta–analysis. Fifteen dietary factors were examined. Fruit intake, dietary fiber, caffeine, and dairy product consumption showed negative correlations with tinnitus prevalence (OR = 0.649, [95% CI 0.532, 0.793], p<0.0001), (OR = 0.918,

[95% CI 0.851, 0.990], p = 0.03), (OR = 0.898, [95% CI 0.862, 0.935], p

- <0.00001), (OR = 0.827, [95% CI, 0.766 to 0.892], p <0.00001),
- respectively. A sensitivity analysis affirmed the robustness of the findings.
- **Conclusions:** The systematic review and meta-analysis findings suggest a
- link between particular dietary elements and a lower occurrence of tinnitus.
- **Keywords:** Diet; Tinnitus; Food intake; Nutrition; Odds ratio

51 STRENGTHS AND LIMITATIONS OF THIS STUDY

- This study conducted a thorough literature screening, assessed the quality of the literature based on international standards, and excluded articles with a high risk of bias.
- This review involved a large population base, improving its representation of fundamental population characteristics and ensuring relatively reliable outcomes.
- There was minimal heterogeneity among the studies regarding the main observations, ensuring the solidity of the findings.
- The relatively small number of included articles may have led to certain beneficial dietary factors (such as vegetables and eggs) not demonstrating significant differences. In addition, due to limited data in the original literature, a dose-effect meta-analysis cannot be supported.
- The majority of included articles were cross-sectional studies, underscoring the necessity for further cohort studies or Mendelian

 randomization studies to investigate causal relationships and provide additional clinical evidence for the dietary prevention of tinnitus.

Introduction

Tinnitus, characterized by perceived sounds such as buzzing, cicadas, or electric currents, occurs without external auditory stimuli ¹. It is associated with distress, depression, anxiety, stress, and, in severe cases, suicide, significantly affecting overall quality of life² ³. Recent epidemiological data suggests a global pooled prevalence of around 14.4% in adults and 13.6% in children and adolescents⁴. The notable prevalence of tinnitus and its substantial impact on life and mental well-being have increasingly become a significant medical and societal concern. The origins of tinnitus remain elusive and involve a range of factors. Some researchers have suggested neural dysfunction or circulatory issues in the inner ear, abnormal neuronal activity in central auditory pathways, and irregular activity in nonauditory brain regions like the anterior insula, anterior cingulate cortex, and thalamus⁵. In clinical practice, treatments for tinnitus include psychological management counseling, cognitive—behavioral therapy, tinnitus retraining therapy, sound therapy, repetitive transcranial magnetic stimulation, medication, and surgery. However, only cognitive-behavioral therapy has definitively improved tinnitus prevalence in a large randomized controlled trial⁶ ⁷. Due to an

incomplete understanding of central neuropathological mechanisms, no single treatment universally meets the needs of all patients⁸ 9.

In recent times, there has been a growing push to reduce tinnitus prevalence

 In recent times, there has been a growing push to reduce tinnitus prevalence through dietary adjustments¹⁰ 11. However, the precise connection between diet and tinnitus remains unclear. A population study investigating the correlation between diet and tinnitus among UK adults found a decrease in tinnitus occurrence with higher fruit and vegetable consumption. Conversely, avoiding dairy was linked to a higher risk of tinnitus. On the other hand, abstaining from eggs, adding fish to the diet, and consuming caffeinated beverages were suggested to potentially lower the risk of tinnitus². Another study in British adults showed that higher fat intake was associated with a greater likelihood of experiencing tinnitus¹¹. Similarly, Lee and Kim identified risk factors for tinnitus, including low water, protein, riboflavin, and niacin intake, although this was unrelated to fruit and vegetable consumption¹². Tang et al. ¹³ found that inadequate fruit fiber (<3.6 g/day) and grain fiber (<4.2 g/day) intake were linked to a 65% and 54% increased risk of developing tinnitus over the next decade, respectively. Conflicting results have hindered researchers' ability to understand the potential benefits of diet; hence, a systematic review on the relationship between diet and tinnitus is needed.

As of now, there has not been a comprehensive examination through systematic reviews or meta-analyses regarding the link between typical

dietary patterns and tinnitus. Our objective was to systematically explore
this association while accounting for potential confounding variables. The
study aimed to furnish clinical evidence to inform the development of
dietary prevention approaches for tinnitus.

Method

According to the guidelines of the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) ¹⁴, the protocol for this study was appropriately registered on PROSPERO under the registration number CRD42023493856. Additionally, my reporting adheres to the Meta-analysis of Observational Studies in Epidemiology (MOOSE) guidelines for epidemiological observational studies, as referenced ¹⁵. **Supplemental eTable 1** contains the MOOSE listings, while Supplemental 2 outlines the PRISMA guidelines.

125 Search Strategy

We developed an inclusive search strategy covering diet-related and tinnitus-related subjects to capture pertinent literature from the PubMed, Embase, Web of Science, and Cochrane Library databases. The research design was limited to systematic evaluation. There were no language restrictions imposed on the search, and we considered articles published before May 25, 2024.

The databases were systematically explored using a blend of Medical Subject Headings (MeSH) terms, keywords, and various text word variations related to diet, following the guidance outlined by the Scottish Intercollegiate Guidelines Network: ((tinnitus OR Ringing–Buzzing) AND (diet OR food OR water OR milk OR fish OR fruit OR vegetable OR fiber OR sugar OR meat OR margarine OR fat OR egg OR variety OR caffeine OR carbohydrate OR protein). The screening process is depicted in **Figure** 1. The following inclusion criteria were applied: (1) inclusion of cohort, case-control, or cross-sectional studies; (2) inclusion of all individuals in the study population; (3) consideration of various dietary intakes; and (4) investigation of tinnitus as a study outcome. Exclusion criteria comprised: (1) studies involving therapeutic interventions; and (2) randomized controlled trials, animal experiments, cell studies, case reports, literature, and incomplete or invalid sources. (3) Additionally, the original literature lacked sufficient data to calculate the risk ratio for tinnitus.

Data collection

In **Table 1**, data compilation was conducted by two reviewers (SZ, MZ), including authors' names, participant counts, age spans, survey/diagnosis specifics, and information on food and tinnitus. Given the treatment of

Table 1: Basic information to be incorporated into the article.

Author	Total	Age	Time frame	Data from	Study design	Diet recording method	Disease diagnosis	Type of diet
Carlotta Micaela Jarach 2023	383	40-65	2016-2019	The Mario Negri Institute in Milan (Italy) , Monza e Brianza, Italy	case control	Self-designed questionnaire	Interviewer administered questionnaire and the Italian validated version of the tinnitus handicap inventory	coffee, eggs, butter, meat, fish, cheese, fruit, vegetable, varied diet, dairy, milk
Diana Tang 2022	1217	>50	1997-2009	Blue Mountains Hearing Study	cohort	Semi-quantitative food frequency questionnaire, FFQ	Audiologist administered questionnaire	dietary flavonoids
Diana Tang 2021	1730	>50	1997-2009	Blue Mountains Hearing Study	cohort	Semi-quantitative food frequency questionnaire, FFQ	Audiologist administered questionnaire	carbohydrate, sugar, fiber, fruit, vegetable
Piers Dawes 2020	34576	30-69	2006-2010	UK Biobank resource (Collins 2012).	cross-sectional	Dietary assessment was based on the Oxford Web-Q	An epidemiologic method of hearing investigation	fiber; Fat;
Sang-Yeon Lee 2019	3575	40-64	2012-2013	The sixth Korea National Health and Nutrition Examination Survey (KNHANES)	cross-sectional	Food-frequency questionnaire (FFQ)	Self-designed questionnaire	chocolate
Doh Young Lee 2018	7621	40-80	2013-2015	The sixth Korea National Health and Nutrition Examination Survey (KNHANES)	cross-sectional	Diet was assessed with a semi- quantitative food- frequency questionnaire	Self-designed questionnaire	water, protein, fat, carbohydrate, fiber
Sang-Youp Lee 2018	13448	>19	2009-2012	The sixth Korea National Health and Nutrition Examination Survey	cross-sectional	Food-frequency questionnaire (FFQ)	Self-designed questionnaire	coffee
Christopher Spankovich 2017	2176	20-69	1999-2002	NHANES	cross-sectional	Dietary recall interviews were conducted during 1999–2002 NHANES MEC evaluations.	Self-designed questionnaire	fat, fruit, vegetable, meat, varied diet
Abby McCormack 2014	171722	40-69	2006-2010	UK Biobank resource (Collins 2012).	cross-sectional	The UK Biobank touchscreen questionnaire	Self-designed questionnaire	fruit, vegetable, fish, egg, sugar, coffee, dairy
Jordan T. Glicksman 2014	65085	30- 44(regis tered)	1991-2009	The Nurses' Health Study II	cross-sectional	Extensively validated semiquantitative food frequency questionnaires	Self-designed questionnaire	coffee

dietary intake as a continuous variable, some researchers have typically performed stratified comparisons based on regional intake standards and researchers' characteristics. This strategy aimed to explore the impact of varying levels of increased intake on tinnitus prevalence. For most continuous variables associated with food intake, adjusted OR values were assimilated in the meta-analysis when stratified according to dose intake, with the exclusion of the reference group. In cases of direct comparison, the singular adjusted OR value was integrated. Further insights on odds ratios (ORs) are provided in **Supplemental eTable 2**.

Literature quality evaluation

 The assessment of individual study quality was conducted by two reviewers (SZ and MZ) using a modified version of the Newcastle–Ottawa Scale. Previous grading categorized studies as having a high (<5 stars), moderate (5–7 stars), or low (≥8 stars) risk of bias (see eTable 3 in the Supplement).

Statistical analysis

Data analysis was performed using RevMan (version 5.3) and Stata (version 15.0). Mixed–effect models were utilized to aggregate maximally covariate-adjusted odds ratios (ORs) across all studies. Due to infrequent events and short follow–up periods, odds ratios (ORs), relative risks (RRs), and hazard ratios (HRs) showed approximate equality. Our findings align consistently with our previous results in terms of odds ratios (ORs). In

 cases where the P value of the Q test was <0.10 or the I² statistic exceeded 50%, we conducted an assessment to determine significant interstudy heterogeneity. For observational studies, maximally covariate-adjusted estimates were strongly prioritized. If a study employed an analytical method incongruent with synthesis for the majority of other studies, we either converted the effect estimate to the appropriate combined ratio or excluded the study from the meta-analysis. In cases of considerable heterogeneity in the analysis with significant differences, meta-regression was utilized to explore the source of heterogeneity (please note: Meta-regression was considered when the data included in the analysis were greater than 10). We visually assessed the asymmetry of the funnel plot and used Egger's bias to detect possible publication bias, with estimation of missing studies conducted using eMethods if publication bias was suspected (please note: Publication bias analysis was considered when the data included in the analysis were greater than 6). Moreover, we conducted a sensitivity

Patient and public involvement

Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

analysis of the pooled results employing a one-by-one exclusion method.

Results

Ten articles were found in the search² ¹¹⁻¹³ ¹⁶⁻²¹. Among these, two articles delved into individual dietary factors, namely, chocolate ¹⁸ and flavonoids ¹⁷, which were not investigated in other studies. While these two articles were included in the narrative review, they were excluded from the meta-analysis. The remaining eight articles comprised the dataset for the meta-analysis.

Fifteen common dietary factors were analyzed, and dietary sources were

assessed using validated nutrition/diet questionnaires. The combined findings revealed that four diets (caffeine, fruit, dietary fiber, and dairy products) exhibited a negative association with the prevalence of tinnitus.

A meta-analysis of dietary factors

 The meta-analysis included eight studies with a total of 301,533 people and analyzed 15 dietary factors, as shown in Figure 2: carbohydrates (2/8, Supplemental eFigure 1), caffeine (4/8, Supplemental eFigure 2), varied diets (2/8, Supplemental eFigure 3), eggs (2/8, Supplemental eFigure 4), fruits (3/9, Supplemental eFigure 5), fiber (2/8, Supplemental eFigure 6), fat (3/8, Supplemental eFigure 7), margarine (2/8, Supplemental eFigure 8), meat (2/8, Supplemental eFigure 9), sugar (4/8, Supplemental eFigure 10), protein (2/8, Supplemental eFigure 11), fish (3/8, Supplemental eFigure 12), vegetables (4/8, Supplemental eFigure 13), water (3/8, Supplemental eFigure 14), and dairy (2/8, Supplemental eFigure 15). The summary results are depicted in Figure

 2. Intake of dairy products, fruits, dietary fiber, and caffeine showed negative correlations with the prevalence of tinnitus: 0.827 for dairy [95%] CI 0.766–0.892], $I^2 = 0\%$, p < 0.00001; 0.649 for fruit [95% CI 0.532– [0.793], $I^2 = 0\%$, p < 0.0001; 0.918 for fiber [95% CI 0.851–0.990], $I^2 = 0.0001$ 63%, p = 0.03; and 0.898 for caffeine [95% CI 0.862–0.935], $I^2 = 23\%$, p < 0.003. Protein intake t increased the risk of tinnitus (OR = 1.002 [95%] CI 1.001–1.004], $I^2 = 0\%$, p = 0.009). No associations were found between other dietary factors and tinnitus.

Sensitivity analysis

We conducted sensitivity analyses for various dietary intakes based on predefined analysis criteria (requiring data from included articles to exceed 6). Contradictory outcomes were noted in the aggregated results for caffeine (refer to **Supplemental eFigure 16**), with the analysis attributing these contradictions to data within the same article (Abby McCormack 2014). Sequential exclusion of fruit (refer to **Supplemental eFigure 17**) and dietary fiber (refer to **Supplemental eFigure 18**) maintained the statistical significance of the combined odds ratio. Successive exclusion of summary results for vegetables (refer to **Supplemental eFigure 19**) and sugar (refer to **Supplemental eFigure 20**) revealed no contradictory outcomes in the combined odds ratio; thus, ensuring the robustness of the meta-analysis results. The comprehensive sensitivity analysis indicated the relative robustness of the meta-analysis results, confirming the association

of fruit and dietary fiber intake with the prevalence of tinnitus. No significant associations between other dietary intakes and tinnitus were found.

Publication bias

The funnel plot and Egger test findings for caffeine, fruit, vegetables, diet, sugar, and fat indicated the presence of publication bias (**Supplemental eFigure 21 – 26**). We performed a supplementary analysis using the shear compensation method, yielding consistent results that suggest publication bias did not impact the main outcome.

Discussion

In this systematic review and meta-analysis involving eight observational studies (comprising a total of 301,533 participants), we discovered that increased dietary consumption of fruit, dietary fiber, dairy products, and caffeine was associated with a reduced occurrence of tinnitus. These reductions were 35.1% (20.7%–46.8%) for fruit intake, 9.2% (1%–14.9%) for dietary fiber, 17.3% (10.8%–23.4%) for dairy products, and 10.2% (6.5%–13.8%) caffeine intake, respectively. These results were consistently supported by sensitivity analysis.

The association between caffeine intake and tinnitus remains contentious. Our final findings indicate a positive impact of caffeine on reducing

tinnitus occurrence. Some suggest that caffeine might effectively decrease

tinnitus prevalence, possibly due to its anxiety-reducing effects. Conversely, some scholars argue that individuals with tinnitus often experience insomnia, which caffeine consumption could worsen; thus, exacerbating tinnitus symptoms. Recent observational studies ²² ²³ found no link between caffeine consumption and depression or anxiety levels. Furthermore, additional dose analysis revealed a J-pattern association between caffeine intake and psychiatric disorders, with around 2–3 cups per day associated with decreased risk ²⁴. Caffeine, acting as a nonselective adenosine receptor antagonist, can mitigate anxiety when ingested at a daily dose of 10 mg/kg ²⁵. Genetic analysis also suggests a correlation between caffeine consumption and reduced tinnitus prevalence ²⁶. This effect is achieved through adenosine receptor blockade, dopamine release promotion, acetylcholinesterase activity inhibition, and sympathetic nerve stimulation. Most academics argue that there is a relationship between dietary fiber and fruit intake and the decrease in tinnitus 11 13 20 27, which corresponds to our findings. Some scholars propose that dietary fiber is associated with enhanced insulin sensitivity²⁸. Studies indicate that hyperinsulinemia from low insulin sensitivity could disturb the inner ear environment, potentially raising tinnitus risk ^{29 30}. Conversely, research suggests that fiber and dairy products might enhance blood vessel function³¹, a factor correlated with tinnitus. Abnormal microcirculation, for instance, contributes to a

sustained reduction in ear blood flow, potentially leading to cochlear damage and increasing tinnitus risk ¹³. Unexpectedly, our combined analysis found no correlation between and tinnitus. Identifying vegetable consumption the heterogeneity was difficult due to the limited number of articles. Nevertheless, sensitivity analyses reaffirm the strength of our conclusions. Vegetables and fruits, rich in diverse vitamins and minerals crucial for maintaining health, have been shown to improve ear microcirculation, alleviate tinnitus, and offer additional benefits 12 27. Future studies are expected to shed more light on the discrepancies in results. Our findings indicate that protein increase the occurrence of tinnitus (OR = 1.002, [95% CI 1.001-1.004], p = 0.009). Protein is a crucial nutrient requiring daily consumption and plays a vital role in supporting neuronal activity and neural development³² ³³. Inadequate protein intake can lead to ototoxic side effects and impair the neural function of the auditory system³⁴. Dawes et al.'s study demonstrated that a higher intake of dietary pattern factor 3 (high protein) was linked to a reduced likelihood of tinnitus¹¹. Although low-protein diets may affect auditory vestibular function, no studies specify the necessary amount of protein in the diet. Our analysis found the links between protein intake and tinnitus risk. Moreover, high–protein diets have been shown to induce oxidative stress in the cerebral cortex and hypothalamus of rats³⁵. Hence, further research

on the relationship between protein dosage and tinnitus is warranted in the future.

In line with our analysis, no significant effect of sugar intake on tinnitus was observed (OR = 0.997 [95% CI 0.967, 1.027]). Sugars, water, and carbohydrate are essential daily components, and no links with tinnitus have been identified. High sugar consumption is typically associated with an unhealthy lifestyle. Proinflammatory foods, including sugary items, are often linked to increased not only systemic inflammation but also to microvascular damage, particularly microischemic events³⁶. Elevated blood glucose levels can harm small blood vessels and nerves in the inner ear, leading to pathological alterations in outer hair cells and spiral ganglion cells. This can result in nerve tissue ischemia and hypoxia, leading to nerve damage³⁴. Conversely, Spankovich et al. demonstrated that high carbohydrate intake can prevent hearing loss in older adults³⁷. Tang et al. showed a 45% decrease in tinnitus risk for participants in the fourth quartile compared to the first quartile of carbohydrate intake ¹³. Lee et al. discovered a significant correlation between reduced water intake and tinnitus-related difficulties in young and middle-aged adults¹². Additionally, Yang et al. found that adequate water intake and a lowsodium diet improved hearing and alleviated vertigo and tinnitus in patients with Meniere's disease 38.

 Both excessive and insufficient dietary intake may have adverse effects on tinnitus, underscoring the need for a dose–response analysis of diet, which would provide valuable insights for dietary tinnitus prevention. Several studies have suggested that increasing the score of healthy foods, such as fruits, vegetables, legumes, nuts, fish, and dairy products, may lower the risk of cardiovascular disease and mortality39-41. With each one-fifth increase in the healthy diet score, there was a corresponding decrease in overall mortality rate (HR = 0.92; 0.90–0.93), severe cardiovascular disease (HR = 0.94; 95% CI: 0.93-0.95), myocardial infarction (HR = 0.94; 0.92-0.96), stroke (HR = 0.94; 0.89-0.99), and death or cardiovascular disease (HR = 0.93; $0.92-0.94^{42}$). The outcomes of our analysis did not firmly support a notable connection between fat intake and tinnitus risk, although there was a discernible upward trend. Moreover, high-fat diets contribute to obesity and can lead to insulin resistance⁴³. Conversely, adopting a low–fat/low–cholesterol diet might aid in reducing blood cholesterol and triglyceride levels, potentially alleviating tinnitus symptoms⁴⁴. Future studies are needed to verify the relationship between the fat and tinnitus. A recent study uncovered that increased levels of dietary variety, covering quantity, evenness, and quality, were inversely linked to the risk of depressive symptoms, especially among women and older adults⁴⁵. This could potentially offer relief for tinnitus. Moreover, dietary variety is

 believed to correlate with insulin resistance⁴⁶. Given the protective effects various diets have shown on human health, further exploration of dietary variety is necessary to validate significant associations. Our pooled analysis indicated that a varied diet was not significantly linked to reduced tinnitus prevalence (OR = 0.653 [95% CI 0.410, 1.038]). However, the favorable end of the 95% confidence interval was prominent, hinting at the potential benefits of a varied diet. Nonetheless, this warrants confirmation through additional studies in the future. We found only one study that investigated the impact of chocolate and flavonoids on the onset of tinnitus 18, but it did not provide sufficient data for a meta-analysis. Flavonoids, found abundantly in fruits and vegetables, offer antioxidant, anti-inflammatory, and vascular health benefits, which align with the pathophysiology of age-related hearing loss and tinnitus⁴⁷. Additionally, flavonoids interact with signaling cascades involving protein and lipid kinases, inhibiting neuronal death induced by neurotoxicants like oxygen radicals and promoting neuronal survival and synaptic plasticity⁴⁸. Despite the hypothesis that dietary flavonoids might protect against tinnitus development over a 10-year period, Tang et al. 47. did not support this idea. However, it is important to note that this study had limitations, such as insufficient data collection. Chocolate is a globally consumed product renowned for its high phenolic compound content (flavonoids being a subclass of polyphenols) ⁴⁹. A study by Lee et al. indicated that chocolate consumption is not linked to tinnitus or tinnitus—related issues¹⁸. An animal study demonstrated that polyphenols alleviate oxidative stress in the cochlea by suppressing apoptotic signaling pathways⁵⁰. Nonetheless, excessive chocolate consumption can have adverse effects on brain hyperexcitability⁵¹. Future investigations into the association between chocolate consumption and tinnitus should take into account the intake dosage.

This systematic review and meta-analysis mark the first attempt to explore the epidemiological link between diet and tinnitus. While we examined the relationships between fruit, dietary fiber, and caffeine intake and a reduced prevalence of tinnitus, it remains inconclusive whether a causal

relationship exists. Additionally, prolonged exposure to stress emerged as

a significant predisposing factor for tinnitus⁵².

Conclusion

Diet-based strategies for tinnitus prevention are anticipated to play a significant role in chronic tinnitus management. Existing evidence suggests that consuming fruit, dietary fiber, caffeine, and dairy may be associated with a reduced prevalence of tinnitus. The primary underlying mechanisms may involve the protective effects of these diets on blood vessels and nerves, as well as their anti-inflammatory and antioxidant properties. However, it is crucial to interpret our findings cautiously due to

395	the overall low quality of the evidence available. In the future, further well-
396	designed, large-scale, cross-population cohort studies are warranted to
397	complement and verify the relationship between dietary intake and tinnitus.
398	Additionally, focusing on the dosage and categorization of each dietary
399	intake would provide valuable insights.
400	
401	Author Contribution
402	All authors contributed to the study's conception and design. SZ, MZ, XW,
403	YJ conducted data collection and analysis. SZ, QZ designed the test plan.
404	QF as the paper guide, control the quality of the paper, XH, XL, XW, HW
405	drew the chart. XC, LW, LF completed the writing of the test plan. XL and
406	QZ revised the manuscript.
407	
408	Author Declaration
409	The author has no direct conflict of interest.
410	
411	Ethical Approval
412	The article belongs to the review category and does not require the
413	approval of the ethics committee.
414	
415	Funding

Funding

This work was supported by the National Natural Science Foundation of

417	China (No. 81774131, 82174198), 'Xinglin Scholars Scientific Research
418	Promotion Plan of Chengdu University of Traditional Chinese Medicine
419	Innovation team of traditional Chinese medicine otorhinolaryngology
420	discipline, natural science (No. XKTD2021003).

Data availability statement

The data used to support the findings of this study are available from the corresponding author upon request.

Reference

- 1. Mazurek B, Hesse G, Sattel H, et al. S3 Guideline: Chronic Tinnitus: German Society for
- 428 Otorhinolaryngology, Head and Neck Surgery e. V. (DGHNO-KHC). *Hno* 2022;70(11):795-827.
- 429 doi: 10.1007/s00106-022-01207-4 [published Online First: 2022/10/14]
- 2. McCormack A, Edmondson-Jones M, Mellor D, et al. Association of dietary factors with
- 431 presence and severity of tinnitus in a middle-aged UK population. PloS one
- 432 2014;9(12):e114711. doi: 10.1371/journal.pone.0114711 [published Online First: 2014/12/17]
- 433 3. MacDonald C, Caimino C, Burns-O'Connell G, et al. Tinnitus, Suicide, and Suicidal Ideation:
- 434 A Scoping Review of Primary Research. Brain sciences 2023;13(10) doi:
- 435 10.3390/brainsci13101496 [published Online First: 2023/10/28]
- 436 4. Jarach CM, Lugo A, Scala M, et al. Global Prevalence and Incidence of Tinnitus: A
- 437 Systematic Review and Meta-analysis. JAMA neurology 2022;79(9):888-900. doi
- 438 10.1001/jamaneurol.2022.2189 [published Online First: 2022/08/09]

- 439 5. Langguth B, Kreuzer PM, Kleinjung T, et al. Tinnitus: causes and clinical management. *The*
- 440 Lancet Neurology 2013;12(9):920-30. doi: 10.1016/s1474-4422(13)70160-1 [published Online
- 441 First: 2013/08/21]
- 442 6. Tang D, Li H, Chen L. Advances in Understanding, Diagnosis, and Treatment of Tinnitus.
- 443 Advances in experimental medicine and biology 2019;1130:109-28. doi: 10.1007/978-981-13-
- 444 6123-4_7 [published Online First: 2019/03/28]
- 7. Wu V, Cooke B, Eitutis S, et al. Approach to tinnitus management. *Canadian family physician*
- 446 Medecin de famille canadien 2018;64(7):491-95. [published Online First: 2018/07/14]
- 8. Sereda M, Xia J, El Refaie A, et al. Sound therapy (using amplification devices and/or sound
- generators) for tinnitus. *The Cochrane database of systematic reviews* 2018;12(12):Cd013094.
- doi: 10.1002/14651858.CD013094.pub2 [published Online First: 2018/12/28]
- 9. Lewis S, Chowdhury E, Stockdale D, et al. Assessment and management of tinnitus:
- 451 summary of NICE guidance. BMJ (Clinical research ed) 2020;368:m976. doi
- 452 10.1136/bmj.m976 [published Online First: 2020/04/03]
- 453 10. Marcrum SC, Engelke M, Goedhart H, et al. The Influence of Diet on Tinnitus Severity:
- Results of a Large-Scale, Online Survey. Nutrients 2022;14(24) doi: 10.3390/nu14245356
- 455 [published Online First: 2022/12/24]
- 456 11. Dawes P, Cruickshanks KJ, Marsden A, et al. Relationship Between Diet, Tinnitus, and
- 457 Hearing Difficulties. *Ear and hearing* 2020;41(2):289-99. doi: 10.1097/aud.0000000000000765
- 458 [published Online First: 2019/07/30]
- 459 12. Lee DY, Kim YH. Relationship Between Diet and Tinnitus: Korea National Health and
- 460 Nutrition Examination Survey. Clinical and experimental otorhinolaryngology 2018;11(3):158-

- 461 65. doi: 10.21053/ceo.2017.01221 [published Online First: 2018/02/13]
- 462 13. Tang D, Tran Y, Shekhawat GS, et al. Dietary Fibre Intake and the 10-Year Incidence of
- 463 Tinnitus in Older Adults. Nutrients 2021;13(11) doi: 10.3390/nu13114126 [published Online
- 464 First: 2021/11/28]

- 465 14. Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated
- 466 guideline for reporting systematic reviews. BMJ (Clinical research ed) 2021;372:n71. doi:
- 467 10.1136/bmj.n71 [published Online First: 2021/03/31]
- 468 15. Stroup DF, Berlin JA, Morton SC, et al. Meta-analysis of observational studies in
- 469 epidemiology: a proposal for reporting. Meta-analysis Of Observational Studies in
- 470 Epidemiology (MOOSE) group. *Jama* 2000;283(15):2008-12. doi: 10.1001/jama.283.15.2008
- 471 [published Online First: 2000/05/02]
- 472 16. Jarach CM, Lugo A, Garavello W, et al. The Role of Diet in Tinnitus Onset: A Hospital-
- 473 Based Case-Control Study from Italy. *Nutrients* 2023;15(3) doi: 10.3390/nu15030621
- 474 [published Online First: 2023/02/12]
- 475 17. Tang D, Tran Y, Lewis JR, et al. Associations between intake of dietary flavonoids and the
- 476 10-year incidence of tinnitus in older adults. *European journal of nutrition* 2022;61(4):1957-64.
- 477 doi: 10.1007/s00394-021-02784-w [published Online First: 2022/01/25]
- 478 18. Lee SY, Jung G, Jang MJ, et al. Association of Chocolate Consumption with Hearing Loss
- 479 and Tinnitus in Middle-Aged People Based on the Korean National Health and Nutrition
- 480 Examination Survey 2012⁻2013. *Nutrients* 2019;11(4) doi: 10.3390/nu11040746 [published
- 481 Online First: 2019/04/03]
- 482 19. Lee SY, Jung G, Jang MJ, et al. Association of Coffee Consumption with Hearing and

483	Tinnitus Based on a National Population-Based Survey. <i>Nutrients</i> 2018;10(10) doi:
484	10.3390/nu10101429 [published Online First: 2018/10/06]
485	20. Spankovich C, Bishop C, Johnson MF, et al. Relationship between dietary quality, tinnitus
486	and hearing level: data from the national health and nutrition examination survey, 1999-2002.
487	International journal of audiology 2017;56(10):716-22. doi: 10.1080/14992027.2017.1331049
488	[published Online First: 2017/05/30]
489	21. Glicksman JT, Curhan SG, Curhan GC. A prospective study of caffeine intake and risk of
490	incident tinnitus. The American journal of medicine 2014;127(8):739-43. doi:
491	10.1016/j.amjmed.2014.02.033 [published Online First: 2014/03/13]
492	22. Castro A, Gili M, Visser M, et al. Soft Drinks and Symptoms of Depression and Anxiety in
493	Overweight Subjects: A Longitudinal Analysis of an European Cohort. <i>Nutrients</i> 2023;15(18)
494	doi: 10.3390/nu15183865 [published Online First: 2023/09/28]
495	23. Makki NM, Alharbi ST, Alharbi AM, et al. Caffeine Consumption and Depression, Anxiety,
496	and Stress Levels Among University Students in Medina: A Cross-Sectional Study. Cureus
497	2023;15(10):e48018. doi: 10.7759/cureus.48018 [published Online First: 2023/11/02]
498	24. Min J, Cao Z, Cui L, et al. The association between coffee consumption and risk of incident
499	depression and anxiety: Exploring the benefits of moderate intake. Psychiatry research
500	2023;326:115307. doi: 10.1016/j.psychres.2023.115307 [published Online First: 2023/06/23]
501	25. Imam-Fulani A, Owoyele BV. Effect Of Caffeine and Adrenaline on Memory and Anxiety in
502	Male Wistar Rats. Nigerian journal of physiological sciences : official publication of the
503	Physiological Society of Nigeria 2022;37(1):69-76. doi: 10.54548/njps.v37i1.9 [published
504	Online First: 2022/08/11]

- 26. Cresswell M, Casanova F, Beaumont RN, et al. Understanding Factors That Cause Tinnitus:
- A Mendelian Randomization Study in the UK Biobank. *Ear and hearing* 2022;43(1):70-80. doi:
- 507 10.1097/aud.000000000001074 [published Online First: 2021/06/11]
- 508 27. Tomanic M, Belojevic G, Jovanovic A, et al. Dietary Factors and Tinnitus among
- Adolescents. *Nutrients* 2020;12(11) doi: 10.3390/nu12113291 [published Online First:
- 510 2020/10/31]

- 28. Barber TM, Kabisch S, Pfeiffer AFH, et al. The Health Benefits of Dietary Fibre. *Nutrients*
- 512 2020;12(10) doi: 10.3390/nu12103209 [published Online First: 2020/10/25]
- 513 29. Mangabeira Albernaz PL, Fukuda Y. Glucose, insulin and inner ear pathology. Acta oto-
- *laryngologica* 1984;97(5-6):496-501. doi: 10.3109/00016488409132927 [published Online First:
- 515 1984/05/01]
- 30. Borghi C, Cosentino ER, Rinaldi ER, et al. Tinnitus in elderly patients and prognosis of mild-
- 517 to-moderate congestive heart failure: a cross-sectional study with a long-term extension of the
- 518 clinical follow-up. *BMC medicine* 2011;9:80. doi: 10.1186/1741-7015-9-80 [published Online
- 519 First: 2011/06/30]
- 31. Jeong Y, Lee KW, Kim H, et al. Association of milk and dairy product consumption with the
- incidence of cardio-cerebrovascular disease incidence in middle-aged and older Korean adults:
- 522 a 16-year follow-up of the Korean Genome and Epidemiology Study. Nutrition research and
- 523 practice 2023;17(6):1225-37. doi: 10.4162/nrp.2023.17.6.1225 [published Online First:
- 524 2023/12/06]
- 32. Cui F, Li H, Cao Y, et al. The Association between Dietary Protein Intake and Sources and
- 526 the Rate of Longitudinal Changes in Brain Structure. *Nutrients* 2024;16(9) doi:

- 527 10.3390/nu16091284 [published Online First: 2024/05/11]
- 33. Abey NO, Ebuehi OAT, Imaga NOA. Neurodevelopment and Cognitive Impairment in
- 529 Parents and Progeny of Perinatal Dietary Protein Deficiency Models. Frontiers in neuroscience
- 530 2019;13:826. doi: 10.3389/fnins.2019.00826 [published Online First: 2019/09/26]
- 531 34. Chen HL, Tan CT, Wu CC, et al. Effects of Diet and Lifestyle on Audio-Vestibular
- 532 Dysfunction in the Elderly: A Literature Review. Nutrients 2022;14(22) doi:
- 533 10.3390/nu14224720 [published Online First: 2022/11/27]
- 35. Żebrowska E, Maciejczyk M, Żendzian-Piotrowska M, et al. High Protein Diet Induces
- Oxidative Stress in Rat Cerebral Cortex and Hypothalamus. *International journal of molecular*
- 536 sciences 2019;20(7) doi: 10.3390/ijms20071547 [published Online First: 2019/03/31]
- 36. Sardone R, Lampignano L, Guerra V, et al. Relationship between Inflammatory Food
- Consumption and Age-Related Hearing Loss in a Prospective Observational Cohort: Results
- from the Salus in Apulia Study. Nutrients 2020;12(2) doi: 10.3390/nu12020426 [published
- 540 Online First: 2020/02/13]
- 37. Spankovich C, Hood LJ, Silver HJ, et al. Associations between diet and both high and low
- 542 pure tone averages and transient evoked otoacoustic emissions in an older adult population-
- 543 based study. Journal of the American Academy of Audiology 2011;22(1):49-58. doi:
- 544 10.3766/jaaa.22.1.6 [published Online First: 2011/03/23]
- 38. Yang X, Lin C, Wu Q, et al. Low-sodium diet with adequate water intake improved the
- 546 clinical efficacy in M é nière's disease. Acta oto-laryngologica 2024;144(1):14-18. doi:
- 547 10.1080/00016489.2024.2315302 [published Online First: 2024/02/20]
- 548 39. Ocagli H, Berti G, Rango D, et al. Association of Vegetarian and Vegan Diets with

- 549 Cardiovascular Health: An Umbrella Review of Meta-Analysis of Observational Studies and
- Randomized Trials. Nutrients 2023;15(19) doi: 10.3390/nu15194103 [published Online First:
- 551 2023/10/14]

- 552 40. Tan L, Stagg L, Hanlon E, et al. Associations between Vegetable Nitrate Intake and
- 553 Cardiovascular Disease Risk and Mortality: A Systematic Review. *Nutrients* 2024;16(10) doi:
- 554 10.3390/nu16101511 [published Online First: 2024/05/25]
- 41. Doundoulakis I, Farmakis IT, Theodoridis X, et al. Effects of dietary interventions on
- 556 cardiovascular outcomes: a network meta-analysis. *Nutrition reviews* 2024;82(6):715-25. doi:
- 557 10.1093/nutrit/nuad080 [published Online First: 2023/07/11]
- 42. Mente A, Dehghan M, Rangarajan S, et al. Diet, cardiovascular disease, and mortality in
- 80 countries. *European heart journal* 2023;44(28):2560-79. doi: 10.1093/eurheartj/ehad269
- 560 [published Online First: 2023/07/07]
- 561 43. Tsai SF, Wu HT, Chen PC, et al. High-fat diet suppresses the astrocytic process
- arborization and downregulates the glial glutamate transporters in the hippocampus of mice.
- 563 Brain research 2018;1700:66-77. doi: 10.1016/j.brainres.2018.07.017 [published Online First:
- 564 2018/07/17]
- 44. Musleh A, Alshehri S, Qobty A. Hyperlipidemia and its relation with tinnitus: Cross-sectional
- 566 approach. Nigerian journal of clinical practice 2022;25(7):1046-49. doi:
- 567 10.4103/njcp.njcp_1465_21 [published Online First: 2022/07/22]
- 568 45. Li Z, Li PW, Zhang D. Association between all aspects of dietary diversity and risk of
- 569 depressive symptoms in US adults. Food & function 2023;14(20):9204-11. doi:
- 570 10.1039/d3fo00642e [published Online First: 2023/10/04]

- 46. Mozaffari H, Hosseini Z, Lafrenière J, et al. The role of dietary diversity in preventing
- 572 metabolic-related outcomes: Findings from a systematic review. Obesity reviews : an official
- 573 journal of the International Association for the Study of Obesity 2021;22(6):e13174. doi:
- 574 10.1111/obr.13174 [published Online First: 2021/02/23]
- 575 47. Tang D, Tran Y, Shekhawat GS, et al. Dietary Flavonoid Intake and Chronic Sensory
- 576 Conditions: A Scoping Review. *Antioxidants (Basel, Switzerland)* 2022;11(7) doi:
- 577 10.3390/antiox11071214 [published Online First: 2022/07/28]
- 578 48. Nehlig A. The neuroprotective effects of cocoa flavanol and its influence on cognitive
- performance. British journal of clinical pharmacology 2013;75(3):716-27. doi: 10.1111/j.1365-
- 580 2125.2012.04378.x [published Online First: 2012/07/11]
- 49. da Silva Medeiros N, Koslowsky Marder R, Farias Wohlenberg M, et al. Total Phenolic
- Content and Antioxidant Activity of Different Types of Chocolate, Milk, Semisweet, Dark, and
- 583 Soy, in Cerebral Cortex, Hippocampus, and Cerebellum of Wistar Rats. *Biochemistry research*
- 584 international 2015;2015:294659. doi: 10.1155/2015/294659 [published Online First:
- 585 2015/12/10]
- 586 50. Sánchez-Rodríguez C, Cuadrado E, Riestra-Ayora J, et al. Polyphenols protect against
- age-associated apoptosis in female rat cochleae. *Biogerontology* 2018;19(2):159-69. doi:
- 588 10.1007/s10522-018-9747-7 [published Online First: 2018/01/25]
- 589 51. Cicvaric A, Bulat T, Bormann D, et al. Sustained consumption of cocoa-based dark
- 590 chocolate enhances seizure-like events in the mouse hippocampus. Food & function
- 591 2018;9(3):1532-44. doi: 10.1039/c7fo01668a [published Online First: 2018/02/13]
- 592 52. Simoens VL, Hébert S. Cortisol suppression and hearing thresholds in tinnitus after low-

593	dose de	xamethason	e challenge.	ВМС	ear,	nose,	and	throat	disorders	2012;12:4.	doi
594	10.1186/	1472-6815- ⁻	12-4 [publishe	ed Online	e Firs	st: 2012	2/03/2	8]			
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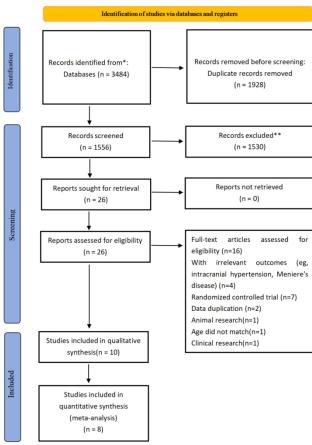
Figure 1: Flow chart

Figure 2: Risk ratio summary of diet and tinnitus prevalence

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^{*}means: The search results of the four databases according to the pre-specified database search strategy.

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^{**}means: The process of selecting articles for title and abstract based on inclusion exclusion criteria.

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Type of diet	Study, n	I^2	OR	LOR	UOR	95%CI	Grade	Evidence class
Carbohydrate	2	33.0%	1.001	1.000	1.002		Low	NS
Caffeine	3	23.0%	0.898	0.862	0.935	+	Low	Class II
Varied diet	2	50.0%	0.653	0.410	1.038		Very low	NS
Egg	2	55.0%	1.010	0.880	1.160		Very low	NS
Fruit	3	0.0%	0.649	0.532	0.793	——	Moderate	Class II
Fiber	3	63.0%	0.918	0.851	0.990		Low	Class II
Fat	3	73.0%	1.072	0.973	1.181	+	Very low	NS
Margarine	2	0.0%	1.208	0.900	1.622		Low	NS
Meat	2	0.0%	1.099	0.783	1.542		Low	NS
Protein	2	0.0%	1.002	1.001	1.004	•	Low	Class III
Sugar	3	0.0%	0.997	0.967	1.027	•	Low	NS
Fish	3	72.0%	0.979	0.907	1.056	- -	Very low	NS
Vegetable	4	0.0%	1.101	0.907	1.337	- •	Very low	NS
Water	3	0.0%	1.003	0.992	1.014		Low	NS
Dairy	2	0.0%	0.827	0.766	0.892		Low	Class II
						0.000 0.200 0.400 0.600 0.800 1.000 1.200 1.400 1.600 1.800		

The blue or red dots represent OR values, and the black lines represent confidence intervals p<0.05 indicates statistical difference.

The evidence classification criteria: Class I (convincing evidence), Class II (highly suggestive evidence), Class III (suggestive evidence), Class IV (weak evidence), and NS (non-significant).
GRADE:Grade of Recommendations Assessment, Development, and Evaluation.

Moderate: The results of current efficacy evaluation are likely to be close to the true value; Low: The reliability of the current efficacy evaluation results is uncertain;

Very low: The reliability of the current efficacy evaluation results is very uncertain;

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	eFigure 24:Publication bias and Egger test on vegetable. eFigure 25:Publication bias and Egger test on sugar.	29 29
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3	eFigure 26: Publication bias and Egger test on fat.	33
4 5	eTable 1. Meta-analysis of Observational Studies in Epidemiology (MOOSE) Checklist	34
6	eTable 2: Dietary risk ratio associated with tinnitus	36
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((tinnitus OR Ringing-Buzzing) AND (diet OR food OR water OR milk OR fish OR fruit OR vegetable OR fiber OR sugar OR margarine OR fat OR egg OR diversity OR caffeine OR carbohydrate) in Title Abstract Keyword

Stata analysis

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Page 36

Stata analysis

We used mixed-effects models to pool maximally covariate-adjusted odds ratios (ORs) from each study. Due to the low incidence of events and short follow-up events, OR, RR, and HR were approximately equal, so our results were uniformly expressed in OR. If the P-value of the q test was <0.10 or the I $\frac{1}{20}$ stability expressed and considered the inter-study heterogeneity to be significant. For observational studies, we maximally support covariate-adjusted estimates. If a tutoff uses an analytical method that is incompatible with synthesis for most other studies, we convert the effect estimate to the appropriate combined ratio or exclude the study from the effect estimate to the appropriate combined ratio or exclude the study from the effect estimate to the appropriate combined ratio or exclude the study from the effect estimate to the appropriate combined ratio or exclude the study from the effect estimate to the appropriate combined ratio or exclude the study from the effect estimate to the appropriate combined ratio or exclude the study from the effect estimate to the appropriate combined ratio or exclude the study from the effect estimate to the appropriate combined ratio or exclude the study from the effect estimate to the appropriate combined ratio or exclude the study from the effect estimate to the appropriate combined ratio or exclude the study from the effect estimate to the effect estimate to

Publication bias

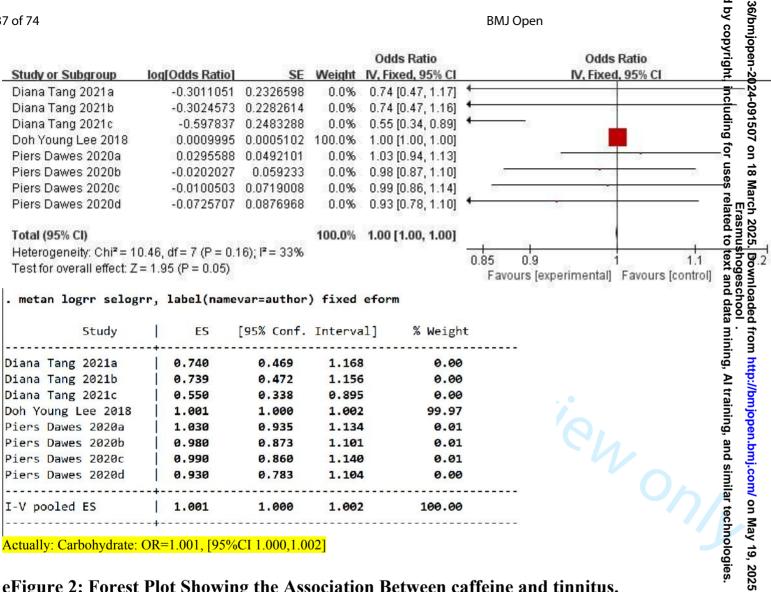
If the article heterogeneity is large in the analysis with statistical differences, we will use meta regression to investigate the source of the assessed the asymmetry of the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected of

Analysis software

We conducted all analyses using stata (version 16) and Review Manager (version 5.3). Unless otherwise specified, we confidence a two-sided P value of <0.05 as statistically significant. **eFigure 1: Forest Plot Showing the Association Between carbohydrate and tinnitus.**Black diamonds are the estimated pooled odd ratio (OR) for each random-effects meta-analysis; Red box sizes reflect the relative weight apportioned to studies in the meta-analysis.

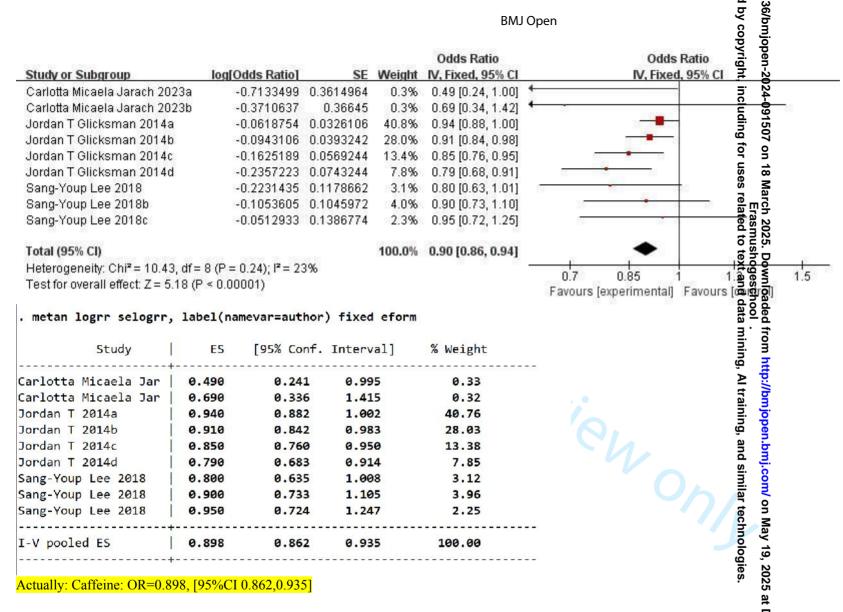
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Carbohydrate: OR=1.00, [95%CI 1.00,1.00], I²=33%, p=0.05.



eFigure 2: Forest Plot Showing the Association Between caffeine and tinnitus.

Black diamonds are the estimated pooled odd ratio (OR) for each random-effects meta-analysis; Red box sizes reflect the relative weight apportioned to studies in the meta- analysis. Caffeine: OR=0.90, [95%CI 0.86,0.94], I²=23% p<0.000001.



eFigure 3: Forest Plot Showing the Association Between diversity and tinnitus.

Black diamonds are the estimated pooled odd ratio (OR) for each random-effects meta-analysis; Red box sizes reflect the relative we that apportioned to studies in the meta-analysis. Diversity: OR=0.65, [95%CI 0.41,1.04], I²=50% p=0.08.

EZ-LTA

Odds Ratio

Study or Subgroup	log[Odds Ratio]	SE	Weight	IV, Random, 95% CI	IV, Random, 95%	<u>6,₹1 2</u>
Carlotta Micaela Jarach 2023a	-0.6348783	0.3247361	29.9%	0.53 [0.28, 1.00]		inc
Carlotta Micaela Jarach 2023b	-0.7550226	0.3371826	28.7%	0.47 [0.24, 0.91]	-	-09
Christopher Spankovich 2017	-0.0444	0.2295	41.4%	0.96 [0.61, 1.50]	37 - •	24-091507 including
Total (95% CI)			100.0%	0.65 [0.41, 1.04]	•	for
Heterogeneity: Tau ² = 0.09; Chi ² :	= 3.98, df = 2 (P = 1	0.14); $I^2 = 50^\circ$	%		0.01 0.1 1	us 18 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
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Study	ES	[95% (Conf.	Interval]	% Weight	5. Downl shoges text an
Carlotta Micaela Jar	0.530	0.2	80	1.002	29.86	oaded chool d data
Carlotta Micaela Jar	0.470	0.2	43	0.910	28.60	
Christopher Spankovi	0.950	0.6	96	1.490	41.54	ni m
D+L pooled ES	0.653	0.4	10	1.038	100.00	http://bmjopei g, Al training,
Actually: diversity: OR=0.653, [9	-+ 95%CI 0.410, 1.03	 8 <mark>8]</mark> .			16),	njoper ining,

ctually: diversity: OR=0.653, [9	95%C1 0.410, 1.03	·8].			oen.bmj.
Figure 4: Forest Plot S	Showing the A	Associatio	on Bet	ween egg and tin	nitus.
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g: OR=1.02, [95%CI 0.91,1.15			ii randon	i-criccis incla-analysis	o 16
				Odds Ratio	Odds Ratio (G. N
Study or Subgroup	log[Odds Ratio]	SE	Weight	IV, Random, 95% CI	IV, Random, 95% El
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bby McCormack 2014a	0.0304592	0.0274031	45.470	1.03 [0.80, 1.08]	<u> </u>
	0.0304592	0.0274031	32.9%	1.15 [1.02, 1.29]	at D
lbby McCormack 2014b	100100000000000000000000000000000000000	0.0589045			at Depa
bby McCormack 2014b bby McCormack 2014c	0.1392621	0.0589045	32.9%	1.15 [1.02, 1.29]	at Departr
bby McCormack 2014b bby McCormack 2014c carlotta Micaela Jarach 2023a	0.1392621 -0.10436	0.0589045 0.1166166 0.338181	32.9% 17.3%	1.15 [1.02, 1.29] 0.90 [0.72, 1.13]	at Department
Abby McCormack 2014a Abby McCormack 2014b Abby McCormack 2014c Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b	0.1392621 -0.10436 -0.0100503	0.0589045 0.1166166 0.338181	32.9% 17.3% 3.0%	1.15 [1.02, 1.29] 0.90 [0.72, 1.13] 0.99 [0.51, 1.92]	at Department GE

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Study	ES	[95% Conf.	Interval]	% Weight	including	2024-091507
Abby McCormack 2014	1.031	0.926	1.148	36.13	ing for	507 on
Abby McCormack 2014a	1.149	1.024	1.290	35.00	r uses	₩ 200
Abby McCormack 2014b	0.901		1.133	20.41	es re	March
Carlotta Micaela Jar			1.921	3.97)late	
Carlotta Micaela Jar 	0.540	0.291	1.003	4.50	ed to	2025.
O+L pooled ES	1.010	0.880	1.160	100.00	ext ar	Down
Actually: diversity: OR=1.010, [95	%CI 0.880, 1.1	[60].	00		d data m	Downloaded from
					ining,	om htt
eFigure 5: Forest Plot Sh	owing the	Association Bo	etween fruit a	nd tinnitus.	Al trair	p://bm]
Black diamonds are the estimated pruit: OR=0.65, [95%CI 0.53,0.79]	oooled odd ration, I ² =0% p<0.0	o (OR) for each rand 001.	om-effects meta-an	alysis; Red box sizes	, a	the apportioned to studies in the meta-an
			Odds Ratio		Odds Ratio	<u> </u>

Study or Subgroup	log[Odds Ratio]	SE	Weight	Odds Ratio IV, Fixed, 95% CI	Odds Ratio d. S. IV, Fixed, 95% CI
Carlotta Micaela Jarach 2023a	-0.040822	0.3655756	7.7%	0.96 [0.47, 1.97]	nila W
Carlotta Micaela Jarach 2023b	-0.2484614	0.3083197	10.9%	0.78 [0.43, 1.43]	
Christopher Spankovich 2017	-0.4942963	0.2033897	25.0%	0.61 [0.41, 0.91]	
Diana Tang 2021a	-0.7550226	0.2457749	17.1%	0.47 [0.29, 0.76]	May
Diana Tang 2021b	-0.3856625	0.230163	19.5%	0.68 [0.43, 1.07]	olog
Diana Tang 2021c	-0.3710637	0.2290667	19.7%	0.69 [0.44, 1.08]	y 19, 2025 nologies.
Total (95% CI)			100.0%	0.65 [0.53, 0.79]	♦ 35 at
Heterogeneity: Chi ² = 3.43, df = 5	$5 (P = 0.63); I^2 = 0\%$				1 10 100
Test for overall effect: $Z = 4.24$ (F	o < 0.0001)				0.01 0.1 1 1000 100 Favours [experimental] Favours [contrat] Favours [contrat]
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Study	ES	[95% Conf.	Interval]	% Weight	includin
Carlotta Micaela Jar	0.960	0.469	1.965	7.74	507 on
Carlotta Micaela Jar	0.780	0.426	1.427	10.88	n 18
Christopher Spankovi	0.610	0.409	0.909	25.01	n 18 March 2025 Erasmu r uses related to
Diana Tang 2021a	0.470	0.290	0.761	17.13	ırch Erela
Diana Tang 2021b	0.680	0.433	1.068	19.53	1 20:1 ted
Diana Tang 2021d	0.690	0.440	1.081	19.72	nushc to tex
I-V pooled ES	0.649	0.532	0.793	100.00	ownloaded geschool
Actually: fruit: OR=0.649, [95%C	I 0.532, 0.793]				ed from htt ol . nta mining,
eFigure 6: Forest Plot Sl	nowing the	Association B	Setween fiber	and tinnitus.	http://b
Black diamonds are the estimated Fiber: OR=0.92, [95%CI 0.85,0.99			dom-effects meta-	analysis; Red box sizes reflect	the relative weight apportioned to studies in the meta- an
		0	dds Ratio	Odds Ratio	anc

				Odds Ratio		Odds	Ratio	pur
Study or Subgroup	log[Odds Ratio]	SE	Weight	IV, Random, 95% CI		IV, Rando	m, 95% CI	S
Diana Tang 2021a	-0.5108256	0.243222	2.3%	0.60 [0.37, 0.97]	23	-		milar
Diana Tang 2021b	-0.1392621	0.2282217	2.6%	0.87 [0.56, 1.36]	199	70 V	- 8	ar
Diana Tang 2021c	-0.2613648	0.2306047	2.5%	0.77 [0.49, 1.21]	19		20	je Se
Doh Young Lee 2018	0.003992	0.0022879	27.8%	1.00 [1.00, 1.01]			•	ħ
Piers Dawes 2020a	-0.0304592	0.0527859	18.3%	0.97 [0.87, 1.08]		-		응
Piers Dawes 2020b	-0.0943106	0.0588071	16.9%	0.91 [0.81, 1.02]		-	†	technologies
Piers Dawes 2020c	-0.1508229	0.0622392	16.1%	0.86 [0.76, 0.97]		-		Š
Piers Dawes 2020d	-0.1392621	0.0759266	13.4%	0.87 [0.75, 1.01]				
Total (95% CI)			100.0%	0.92 [0.85, 0.99]		•		
Heterogeneity: Tau ² = 1	0.01; Chi ^z = 19.09, (df = 7 (P = 0.0)	$(08); I^2 = 6$	63%	0.5	0.7	1 1 5	
Test for overall effect: 2	Z = 2.21 (P = 0.03)				0.5	0.7	1 1.5	z ptroll
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Study	l ES	[95% Conf.	Interval]	% Weight		
Diana Tang 2021a	0.600	0.372	0.966	2.31	₹ 5	
Diana Tang 2021b	0.870	0.556	1.361	2.59	ð o	
Diana Tang 2021d	0.770	0.490	1.210	2.54	_ _	
Doh Young Lee 2018	1.004	1.000	1.009	27.81	s es	
Piers Dawes 2020a	0.970	0.875	1.076	18.30	laro	
Piers Dawes 2020b	0.910	0.811	1.021	16.90	late	
Piers Dawes 2020c	0.860	0.761	0.972	16.14	March 2025. Erasmus es related to	
Piers Dawes 2020d	0.870	0.750	1.010	13.40	tex ho	
D+L pooled ES	0.918	0.851	0.990	100.00	vnlo: and	
Actually: fruit: OR=0.918, [95%CI 0.851.	0.9901.	770		ded ool	
	,	-			from ht mining,	
					ng,	
eFigure 7: Forest Pl	ot Showing	g the Associ	ation Betwe	en fat and tinnitu	s. \(\frac{\bar{P}}{2}\)	
O	•	5			e trai	
Black diamonds are the estir	mated pooled o	odd ratio (OR) for	r each random-e	ffects meta-analysis: Red	box sizes reflect the relative we have apportioned to	studies in the meta- analysis
Fat: OR=1.07, [95%CI 0.97,			i cacii iuiiaoiii-c	irous mou unarysis, nou	a F	, stadies in the metal analysis.
	,	F		Odds Ratio	Odds Ratio D	
					· · · · · · · · · · · · · · · · · · ·	

Study or Subgroup	log[Odds Ratio]	SE	Weight	Odds Ratio IV, Random, 95% CI	1100400040980 1004	Ratio
Christopher Spankovich 2017	-0.3710637	0.1794132	5.9%	0.69 [0.49, 0.98]	OF THE PROPERTY OF THE PROPERT	nila 🐧
Doh Young Lee 2018	0.0029955	0.0010173	27.8%	1.00 [1.00, 1.01]	11	r e
Piers Dawes 2020a	0.0582689	0.0574609	20.2%	1.06 [0.95, 1.19]	<u>≥</u>	n May
Piers Dawes 2020b	0.0861777	0.0700094	17.8%	1.09 [0.95, 1.25]	100 to	no ay
Piers Dawes 2020c	0.1739534	0.0832964	15.5%	1.19 [1.01, 1.40]		19,
Piers Dawes 2020d	0.285179	0.1010838	12.8%	1.33 [1.09, 1.62]		202
Total (95% CI)			100.0%	1.07 [0.97, 1.18]		5 at
Heterogeneity: Tau2 = 0.01; Chi	² = 18.68, df= 5 (P:	= 0.002); I ^z =	73%	55 55 X201	05 07	1 1 0
Test for overall effect: Z = 1.41 (P = 0.16)				0.5 0.7 Favours [experimental]	1 1.5 pa Favours [commont
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	St	udy	ES	[95%	Conf.	Interval	1

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1	. metan logrr selogrr,	label(namev	ar=author)	random	eform	<u>19</u>
2	Study	ES [95% Conf.	Interval] % Weight	1, including
4 5	Christopher Spankovi	0.690	0.485	0.981	5.95	ding
6	Doh Young Lee 2018	1.003	1.001	1.005	27.75	for
7	Piers Dawes 2020a	1.060	0.947	1.186	20.17	1 18 us
8	Piers Dawes 2020b	1.090	0.950	1.250	17.81	es 🚆
9	Piers Dawes 2020c	1.190	1.011	1.401	15.50	arch Er ch
10 11	Piers Dawes 2020d	1.330	1.091	1.621	12.82	
12 13	D+L pooled ES	1.072	0.973	1.181	100.00	2025. Do
14 15						wnloa gesch
16	Actually: fat: OR=1.072, [95%]	CI 0.973, 1.181	l.			dat:
17			•			B . 4
18						in i
19 20 21	eFigure 8: Forest Plot	Showing th	ie Associa	tion Bet	ween margarine an	nd tinnitus.
22 23				each randoi	m-effects meta-analysis; Re	ed box sizes reflect the relative weight apportioned to studies in the meta- analysis
24	Margarine: OR=1.21, [95%CI (J.90,1.03], 1 ² =0%	⁄₀ p=0.∠0.		Odds Datis	Odd- Pati-
25	Study or Subgroup	log[Odds Ra	tiol (SE Weight	Odds Ratio IV, Fixed, 95% CI	Odds Ratio and b IV, Fixed, 95% CI a
26	Carlotta Micaela Jarach 2023a	1 12 metron months	046 0.86526	200 0000000	1.35 [0.25, 7.36]	- 3 °
27 28	Carlotta Micaela Jarach 2023b		722 0.99745		1.40 [0.20, 9.89]	
20	Milena Temania 2020				4 20 (0.00 4.00)	<u> </u>

Study or Subgroup	log[Odds Ratio]	SE	Weight	Odds Ratio IV, Fixed, 95% CI	17 17 27 27 27 27 27 27 27 27 27 27 27 27 27	s Ratio and s	.bmj.	
Carlotta Micaela Jarach 2023a	0.3001046	0.8652602	3.0%	1.35 [0.25, 7.36]		₹ 3	ğ	
Carlotta Micaela Jarach 2023b	0.3364722	0.9974543	2.3%	1.40 [0.20, 9.89]	25	<u> </u>	≥	
Milena Tomanic 2020	0.1856494	0.154809	94.7%	1.20 [0.89, 1.63]		tech	ň M	
Total (95% CI)			100.0%	1.21 [0.90, 1.63]		nolo	May 1	
Heterogeneity: Chi ² = 0.04, df = 3	$2 (P = 0.98); I^2 = 0\%$	5			0.01	1 6.1	. <u>.</u> 0	100
Test for overall effect: Z = 1.28 (F	P = 0.20)				0.01 0.1 Favours [experimental]	Favours [con	tribili at	100

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Study	ES	[95% Con	f. Interval]	% Weight	-09150
Carlotta Micaela J	ar 1.350	0.248	7.359	3.01	for u
Carlotta Micaela J	ar 1.400	0.198	9.889	2.27	18 N
Milena Tomanic 202	0 1.200	0.887	1.624	94.72	larch 20 Eras
I-V pooled ES	1.208	0.900	1.622	100.00	D25. Do musho
	+				wnlo
Actually: margarine: OR=1.208,	[95%CI 0.900, 1.622	2] .			ade ₀
					a d from
eFigure 9: Forest Plot S	Showing the As	ssociation Betw	een meat and tinn	itus.	om http:
			' (2)		//br
Black diamonds are the estimated Meat: OR=1.10, [95%CI 0.78,1.5		OR) for each random-	effects meta-analysis; Rec	d box sizes reflect the relative	رَجِّي الله الله الله الله الله الله الله الل
			Odds Ratio	Odds Ratio	, an b
Study or Subgroup	log[Odds Ratio]	SE Weight N	/, Fixed, 95% CI	IV, Fixed, 95% CI	<u>a</u>
Carlotta Micaela Jarach 2023a	0.3987761 0		1.49 [0.75, 2.95]		wic
Carlotta Micaela Jarach 2023b	-0.0304592 0		0.97 [0.51, 1.85]		ilar
Christophor Chankovich 2017	0.0000600 0	2406067 47.000	1 04 (0 62 4 65)	Co.	: O

Study or Subgroup	log[Odds Ratio]	SE	Weight	Odds Ratio IV, Fixed, 95% CI	Odds Ratio IV, Fixed, 95% CI	, and	5 5 8	
Carlotta Micaela Jarach 2023a	0.3987761	0.3484928	24.6%	1.49 [0.75, 2.95]	10 To	sim	2	
Carlotta Micaela Jarach 2023b	-0.0304592	0.3287067	27.6%	0.97 [0.51, 1.85]		iila	3	
Christopher Spankovich 2017	0.0099503	0.2496967	47.8%	1.01 [0.62, 1.65]	3 - 	rtec	on a	
Total (95% CI)			100.0%	1.10 [0.78, 1.54]	•	hno.	lav	
Heterogeneity: Chi ² = 1.02, df = 3	2 (P = 0.60); I ² = 0%				0.01	<u>0</u> 10	5	100
Test for overall effect: Z = 0.55 (F	P = 0.59)				0.01 0.1 1 Favours [experimental] Favours	[contr	2025	100
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Study	ES	[95% Conf.	Interval]	% Weight	4-09150 ncludin
Carlotta Micaela Jar Carlotta Micaela Jar Christopher Spankovi	1.490 0.970 1.010	0.753 0.509 0.619	2.950 1.847 1.648	24.56 27.60 47.84	7 on 18 March 20 Erasi for uses related
I-V pooled ES	1.099	0.783	1.542	100.00	25. Dow mushoge to text a
Actually: meat: OR=1.099, [95%CI 0.783	, 1.542].	NO			hloaded school .

ctually: meat: OR=1.099, [95%					loaded from chool .	
Figure 10: Forest Plot	Showing the	Associat	ion Be	tween sugar	nd tinnitus.	
lack diamonds are the estimated ugar: OR=1.00, [95%CI 0.97,1.			ch randon	n-effects meta-ana	rsis; Red box sizes reflect the relative that apportioned to studies in the m	eta- analy
Study or Subgroup	log[Odds Ratio]		Weight	Odds Ratio IV, Fixed, 95% CI	Odds Ratio and J.	
Abby McCormack 2014a	0	0.0230439	44.3%	1.00 [0.96, 1.05]	**************************************	
Abby McCormack 2014b	0.0099503		43.2%	1.01 [0.96, 1.06]	ii Ž	
Abby McCormack 2014c	-0.0294288	0.0469906	10.7%	0.97 [0.89, 1.06]	r	
Carlotta Micaela Jarach 2023a	-0.0725707	0.3247361	0.2%	0.93 [0.49, 1.76]	n n n	
Carlotta Micaela Jarach 2023b	-0.210721	0.3237852	0.2%	0.81 [0.43, 1.53]		
Diana Tang 2021a	-0.4462871	0.236286	0.4%	0.64 [0.40, 1.02]		
Diana Tang 2021b	-0.0618754	0.2243772	0.5%	0.94 [0.61, 1.46]	2025	
Diana Tang 2021c	-0.356675	0.2383442	0.4%	0.70 [0.44, 1.12]	. 25 a	
Total (95% CI)			100.0%	1.00 [0.97, 1.03]	♦	
Heterogeneity: Chi² = 6.89, df = 3	$7 (P = 0.44); I^2 = 0\%$				1 <u>≦</u> 0.7 0.85 1 1.2 2 -5	
Test for overall effect: $Z = 0.20$ (F	P = 0.84)				0.7 0.85 1 1.2 ∰5 Favours [experimental] Favours [contr o]]	
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					# # # # # # # # # # # # # # # # # # #	

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Study	ES	[95% Conf.	<pre>Interval]</pre>	% Weight	
Abby McCormack 2014	1.000	0.956	1.046	44.34	
Abby McCormack 2014a	1.010	0.965	1.057	43.25	
Abby McCormack 2014b	0.971	0.886	1.065	10.66	
Carlotta Micaela Jar	0.930	0.492	1.758	0.22	
Carlotta Micaela Jar	0.810	0.429	1.528	0.22	
Diana Tang 2021a	0.640	0.403	1.017	0.42	
Diana Tang 2021b	0.940	0.606	1.459	0.47	
Diana Tang 2021c	0.700	0.439	1.117	0.41	
I-V pooled ES	0.997	0.967	1.027	100.00	

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Study	ES	[95%	Conf.	Interval]	% Weight		36/bmjopen-2024-091507 d by copyright, including		
Abby McCormack 2014	1.000	0	.956	1.046	44.34)24-091507 on including for		
Abby McCormack 2014a	1.010	0	.965	1.057	43.25		7 on J for		
Abby McCormack 2014b	0.971	0	.886	1.065	10.66				
Carlotta Micaela Jar	0.930	0	.492	1.758	0.22		ses		
Carlotta Micaela Jar	0.810	0	.429	1.528	0.22		re E		
Diana Tang 2021a	0.640		. 403	1.017	0.42		h 2 ras ate		
Diana Tang 2021b	0.940		.606	1.459	0.47		025 d to		
Diana Tang 2021c	0.700		.439	1.117	0.41		. Dov shog text		
I-V pooled ES	0.997		.967	1.027	100.00		vnloa esch and c		
Actually: sugar: OR=0.997, [9 eFigure 11: Forest Pla			ssociat	ion Between p	protein and ti	innitus.	18 March 2025. Downloaded from http://bmjope Erasmushogeschool . uses related to text and data mining, Al training		
eFigure 11: Forest Plo	ot Showin	g the As		h random-effects m		box sizes reflect the r	relative we sht appo	ortioned to studies in the	e meta-ana
eFigure 11: Forest Ploads are the estimates of the Signature OR=1.00, [95%CI 1.00, 100]	ot Showin ated pooled od 1.00], I ² =0% p	g the As	R) for eac	h random-effects n	neta-analysis; Red	box sizes reflect the r	relative we sht appo	ortioned to studies in the	: meta-ana
eFigure 11: Forest Ploack diamonds are the estimatish: OR=1.00, [95%CI 1.00, Include the content of the content	ot Showin ated pooled od 1.00], I ² =0% p	g the Asdid ratio (OF p=0.009.	R) for eac	h random-effects n Odds Ratio IV, Fixed, 95% Cl	neta-analysis; Red	box sizes reflect the r	g, weight appo relatived similar	ortioned to studies in the	e meta-ana
Black diamonds are the estima Fish: OR=1.00, [95%CI 1.00,] Study or Subgroup log[0] Doh Young Lee 2018	ot Showin ated pooled od 1.00], I ² =0% p Odds Ratio] 0.001998	g the As dd ratio (OF 0=0.009. SE 0.0007634	R) for eac Weight 99.9%	ch random-effects not only the control of the contr	neta-analysis; Red	box sizes reflect the r	g, weight appo relatived similar	ortioned to studies in the	e meta-ana
eFigure 11: Forest Planck diamonds are the estimates Fish: OR=1.00, [95%CI 1.00, 100] Study or Subgroup log[4	ot Showin ated pooled od 1.00], I ² =0% p Odds Ratio] 0.001998 0 0.0198026 0	g the As Id ratio (OF 0=0.009. SE 0.0007634 0.0546964	(X) for each (Weight 99.9% 0.0%	Odds Ratio V, Fixed, 95% CI 1.00 [1.00, 1.00] 1.02 [0.92, 1.14]	neta-analysis; Red	box sizes reflect the r	g, weight appo relatived similar	ortioned to studies in the	: meta-ana
Black diamonds are the estima Fish: OR=1.00, [95%CI 1.00,] Study or Subgroup logic Doh Young Lee 2018 Piers Dawes 2020a Piers Dawes 2020b	ot Showin ated pooled od 1.00], I ² =0% p Odds Ratio] 0.001998 0 0.0198026 0	g the As dd ratio (OF 0=0.009. SE 0.0007634 0.0546964 0.060906	Weight 99.9% 0.0% 0.0%	ch random-effects not only the control of the contr	neta-analysis; Red	box sizes reflect the r	en. that appo en. that appo g, and similar technolog	ortioned to studies in the	e meta-ana
EFigure 11: Forest Planck diamonds are the estimation of the estim	ot Showin ated pooled od 1.00], I ² =0% p Odds Ratio] 0.001998 0 0.0198026 0 0.0099503	g the As Id ratio (OF 0=0.009. SE 0.0007634 0.0546964 0.060906 0.0680814	Weight 99.9% 0.0% 0.0% 0.0%	Odds Ratio V, Fixed, 95% CI	neta-analysis; Red	box sizes reflect the r	g, aweight appo relatived similar te	ortioned to studies in the	: meta-ana
EFigure 11: Forest Planar Black diamonds are the estimates Fish: OR=1.00, [95%CI 1.00, 100] Study or Subgroup logical Doh Young Lee 2018 Piers Dawes 2020a Piers Dawes 2020b Piers Dawes 2020c	ot Showin ated pooled od 1.00], I ² =0% p Odds Ratiol 0.001998 0 0.0198026 0 0.0099503 -0.0304592 0	g the As Id ratio (OF 0=0.009. SE 0.0007634 0.0546964 0.060906 0.0680814	Weight 99.9% 0.0% 0.0% 0.0% 0.0%	Odds Ratio V, Fixed, 95% CI 1.00 [1.00, 1.00] 1.02 [0.92, 1.14] 1.01 [0.90, 1.14] 0.97 [0.85, 1.11]	neta-analysis; Red	box sizes reflect the r	en.eht appo en.ehnj.com/ on May 19, 2025 g, and similar technologies.	ortioned to studies in the	e meta-ana
Black diamonds are the estima Fish: OR=1.00, [95%CI 1.00,] Study or Subgroup log[0 Doh Young Lee 2018 Piers Dawes 2020a Piers Dawes 2020b Piers Dawes 2020c Piers Dawes 2020d	ot Showin ated pooled od 1.00], I ² =0% p Odds Ratiol 0.001998 0 0.0198026 0 0.0099503 -0.0304592 0 0.0582689 0	g the As dd ratio (OF 0=0.009. SE 0.0007634 0.0546964 0.060906 0.0680814 0.0858348	Weight 99.9% 0.0% 0.0% 0.0% 0.0%	Odds Ratio N, Fixed, 95% CI 1.00 [1.00, 1.00] 1.02 [0.92, 1.14] 1.01 [0.90, 1.14] 0.97 [0.85, 1.11] 1.06 [0.90, 1.25]	neta-analysis; Red	box sizes reflect the r Odds Ratio IV, Fixed, 95% CI	en.eht appo en.ehnj.com/ on May 19, 2025 g, and similar technologies.	ortioned to studies in the	meta-ana
Black diamonds are the estima Fish: OR=1.00, [95%CI 1.00,] Study or Subgroup log[6 Doh Young Lee 2018 Piers Dawes 2020a Piers Dawes 2020b Piers Dawes 2020c Piers Dawes 2020d Total (95% CI)	ot Showin ated pooled od 1.00], I ² =0% p Odds Ratio] 0.001998 0 0.0198026 0 0.0099503 -0.0304592 0 0.0582689 0	g the As dd ratio (OF 0=0.009. SE 0.0007634 0.0546964 0.060906 0.0680814 0.0858348	Weight 99.9% 0.0% 0.0% 0.0% 0.0%	Odds Ratio N, Fixed, 95% CI 1.00 [1.00, 1.00] 1.02 [0.92, 1.14] 1.01 [0.90, 1.14] 0.97 [0.85, 1.11] 1.06 [0.90, 1.25]	neta-analysis; Red	box sizes reflect the r Odds Ratio IV, Fixed, 95% CI	en.eht appo en.ehnj.com/ on May 19, 2025 g, and similar technologies.	ortioned to studies in the	meta-ana
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Black diamonds are the estima Fish: OR=1.00, [95%CI 1.00,] Study or Subgroup log[6] Doh Young Lee 2018 Piers Dawes 2020a Piers Dawes 2020b Piers Dawes 2020c Piers Dawes 2020d Total (95% CI) Heterogeneity: Chi² = 0.78, df	ot Showin ated pooled od 1.00], I ² =0% p Odds Ratio] 0.001998 0 0.0198026 0 0.0099503 -0.0304592 0 0.0582689 0	g the As dd ratio (OF 0=0.009. SE 0.0007634 0.0546964 0.060906 0.0680814 0.0858348	Weight 99.9% 0.0% 0.0% 0.0% 0.0%	Odds Ratio N, Fixed, 95% CI 1.00 [1.00, 1.00] 1.02 [0.92, 1.14] 1.01 [0.90, 1.14] 0.97 [0.85, 1.11] 1.06 [0.90, 1.25]	neta-analysis; Red	box sizes reflect the r	en.eht appo en.ehnj.com/ on May 19, 2025 g, and similar technologies.	ortioned to studies in the	e meta-ana
Black diamonds are the estima Fish: OR=1.00, [95%CI 1.00,] Study or Subgroup log[6] Doh Young Lee 2018 Piers Dawes 2020a Piers Dawes 2020b Piers Dawes 2020c Piers Dawes 2020d Total (95% CI) Heterogeneity: Chi² = 0.78, df	ot Showin ated pooled od 1.00], I ² =0% p Odds Ratio] 0.001998 0 0.0198026 0 0.0099503 -0.0304592 0 0.0582689 0	g the As dd ratio (OF 0=0.009. SE 0.0007634 0.0546964 0.060906 0.0680814 0.0858348	Weight 99.9% 0.0% 0.0% 0.0% 0.0%	Odds Ratio N, Fixed, 95% CI 1.00 [1.00, 1.00] 1.02 [0.92, 1.14] 1.01 [0.90, 1.14] 0.97 [0.85, 1.11] 1.06 [0.90, 1.25]	neta-analysis; Red	box sizes reflect the r	en. that appo en. that appo g, and similar technologies.	ortioned to studies in the	e meta-ana

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Study	ES .	[95% Conf.	<pre>Interval]</pre>	% Weight	2000 NO 600 NO
Doh Young Lee 2018 Piers Dawes 2020a	1.002	1.001 0.916	1.004 1.135	99.94 0.02	
Piers Dawes 2020b	1.010	0.896	1.138	0.02	
Piers Dawes 2020c	0.970	0.849	1.108	0.01	
Piers Dawes 2020d	1.060	0.896	1.254	0.01	
I-V pooled ES	1.002	1.001	1.004	100.00	

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3	Study	ES [95% Conf.	. Interva	al] % Wei	ght	including for	24-0915
5 6	Doh Young Lee 2018	1.002	1.001	1.004	99.	94	ng fo	
7	Piers Dawes 2020a	1.020	0.916	1.135	0.	02	r ug	on 18
8	Piers Dawes 2020b	1.010	0.896	1.138	0.	02	uses	ω Α
9	Piers Dawes 2020c	0.970	0.849	1.108	0.	01	e n	arc)
10 11	Piers Dawes 2020d	1.060	0.896	1.254	0.	01	ated t	n 202
12 13 14	I-V pooled ES	1.002	1.001	1.004	100.	00	Erasmushogeschool . es related to text and data mining, Al	5. Do
19 20 21 22 23 24 25	eFigure 12: Forest Plot Black diamonds are the estimated Fish: OR=0.98, [95%CI 0.91,1.0]	d pooled odd ratio	(OR) for eac				lect the relative	ght apportioned to studies in the meta-analysis.
	Study or Subgroup	log[Odds Ratio]			Odds Ratio Random, 95% Cl	IV		
26	Abby McCormack 2014a	-0.0202027	SE 0.0181367	Weight IV, 34.4%	Random, 95% CI 0.98 [0.95, 1.02]	IV		
26 27	Abby McCormack 2014a Abby McCormack 2014b	-0.0202027 -0.0943106	SE 0.0181367 0.0197415	Weight IV, 34.4% 33.9%	Random, 95% CI 0.98 [0.95, 1.02] 0.91 [0.88, 0.95]	IV	simila	
26	Abby McCormack 2014a Abby McCormack 2014b Abby McCormack 2014c	-0.0202027 -0.0943106 0.0769611	SE 0.0181367 0.0197415 0.0404261	Weight IV, 34.4% 33.9% 25.8%	Random, 95% CI 0.98 [0.95, 1.02] 0.91 [0.88, 0.95] 1.08 [1.00, 1.17]	IV	similar te	on and an analysis of the second seco
26 27 28 29 30	Abby McCormack 2014a Abby McCormack 2014b Abby McCormack 2014c Carlotta Micaela Jarach 2023a	-0.0202027 -0.0943106 0.0769611 0.1739534	SE 0.0181367 0.0197415 0.0404261 0.3557993	Weight IV, 34.4% 33.9% 25.8% 1.0%	Random, 95% CI 0.98 [0.95, 1.02] 0.91 [0.88, 0.95] 1.08 [1.00, 1.17] 1.19 [0.59, 2.39]		similar techr	com/ on May
26 27 28 29 30 31	Abby McCormack 2014a Abby McCormack 2014b Abby McCormack 2014c	-0.0202027 -0.0943106 0.0769611 0.1739534 -0.2876821	SE 0.0181367 0.0197415 0.0404261 0.3557993	Weight IV, 34.4% 33.9% 25.8%	Random, 95% CI 0.98 [0.95, 1.02] 0.91 [0.88, 0.95] 1.08 [1.00, 1.17]		similar technolog	on May 19.
26 27 28 29 30 31 32 33	Abby McCormack 2014a Abby McCormack 2014b Abby McCormack 2014c Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b Milena Tomanic 2020 Total (95% CI)	-0.0202027 -0.0943106 0.0769611 0.1739534 -0.2876821 0.003992	SE 0.0181367 0.0197415 0.0404261 0.3557993 0.3132832 0.1847285	Weight IV. 34.4% 33.9% 25.8% 1.0% 1.3% 3.6%	Random, 95% CI 0.98 [0.95, 1.02] 0.91 [0.88, 0.95] 1.08 [1.00, 1.17] 1.19 [0.59, 2.39] 0.75 [0.41, 1.39]		similar technologies.	com/ on May 18, 2025
26 27 28 29 30 31 32	Abby McCormack 2014a Abby McCormack 2014b Abby McCormack 2014c Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b Milena Tomanic 2020	-0.0202027 -0.0943106 0.0769611 0.1739534 -0.2876821 0.003992	SE 0.0181367 0.0197415 0.0404261 0.3557993 0.3132832 0.1847285	Weight IV. 34.4% 33.9% 25.8% 1.0% 1.3% 3.6%	Random, 95% CI 0.98 [0.95, 1.02] 0.91 [0.88, 0.95] 1.08 [1.00, 1.17] 1.19 [0.59, 2.39] 0.75 [0.41, 1.39] 1.00 [0.70, 1.44]	0.5 0.7	similar technologies.	on May 19. 2025 at 10.5

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Study	ES	[95% Conf.]	Interval]	% Weight	272
Abby McCormack 2014 Abby McCormack 2014a Abby McCormack 2014b Carlotta Micaela Jar Carlotta Micaela Jar	0.980 0.910 1.080 1.190 0.750	0.946 0.875 0.998 0.593 0.406	1.015 0.946 1.169 2.390 1.386	35.43 34.93 27.04 1.14 1.46	
D+L pooled ES	0.979	0.907	1.056	100.00	

				BM.	Open	зывтјоре в by соругі	5 1
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Study	ES	[95% Con	ıf. In	terval]	% Weight	; including for	-2024-094507
Abby McCormack 2014	0.980	0.946		1.015	35.43		
Abby McCormack 2014a	0.910	0.875	i (0.946	34.93		
Abby McCormack 2014b	1.080	0.998		1.169	27.04	uses	
Carlotta Micaela Jar	1.190	0.593		2.390	1.14	s re	
Carlotta Micaela Jar	The state of the s	0.406	;	1.386	1.46	uses related to	, 9
D+L pooled ES	0.979	0.907	' :	1.056	100.00		
Actually: fish: OR=0 979 [95%(TL0 907 1 0561					bownloaded shogeschool text and data	
Actually: fish: OR=0.979, [95%C	[10.907, 1.056].					ata	
						mir o	
aFigure 12. Forest Dlat	Charring 4ha	A aaa ai a4i.	on Dod		hla and tinnitus	ning	
eFigure 13: Forest Plot	Snowing the	Associatio	on Bet	iween vegeta	ible and tinnitus.	, 2	
Diagla diagram da ana tha actimata	منعما مما مما المعناء	(OD) for each		affacts mata an	lygig. Dad hay gigag maflagt	the meletive	ht ammentioned to studies in the mote and
Black diamonds are the estimated Vegetable: OR=1 10 [95%CI 0.9	d pooled odd ratio	(OR) for each	random	n-effects meta-ana	alysis; Red box sizes reflect	the relatives were	aht apportioned to studies in the meta- anal
Black diamonds are the estimated Vegetable: OR=1.10, [95%CI 0.9	d pooled odd ratio 91,1.34], I ² =0% p=	(OR) for each =0.33	ı random			ing,	tht apportioned to studies in the meta- anal
Black diamonds are the estimated Vegetable: OR=1.10, [95%CI 0.9]	d pooled odd ratio 91,1.34], I ² =0% p= log[Odds Ratio]	=0.33		Odds Ratio N, Fixed, 95% CI	Odds	Ratio and	
Vegetable: OR=1.10, [95%CI 0.9 Study or Subgroup Carlotta Micaela Jarach 2023a	91,1.34], I ² =0% p= log[Odds Ratio] -0.2613648	=0.33 SE V 0.3602729	Weight 7.6%	Odds Ratio IV, Fixed, 95% CI 0.77 [0.38, 1.56]	Odds	Ratio and	
Vegetable: OR=1.10, [95%CI 0.9 Study or Subgroup Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b	91,1.34], I ² =0% p= log[Odds Ratio] -0.2613648 -0.2876821	=0.33 SE V 0.3602729 0.321398	Weight 7.6% 9.5%	Odds Ratio IV, Fixed, 95% CI 0.77 [0.38, 1.56] 0.75 [0.40, 1.41]	Odds	ing, and simila	
Vegetable: OR=1.10, [95%CI 0.9 Study or Subgroup Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b Christopher Spankovich 2017	91,1.34], I ² =0% p= log[Odds Ratio] -0.2613648 -0.2876821 0.2231435	=0.33 SE V 0.3602729 0.321398 0.1754021	Weight 7.6% 9.5% 31.9%	Odds Ratio IV, Fixed, 95% CI 0.77 [0.38, 1.56] 0.75 [0.40, 1.41] 1.25 [0.89, 1.76]	Odds	Ratio and similar te	
Vegetable: OR=1.10, [95%CI 0.9 Study or Subgroup Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b Christopher Spankovich 2017 Diana Tang 2021a	91,1.34], I ² =0% p= log[Odds Ratio] -0.2613648 -0.2876821 0.2231435 0.2776318	=0.33 SE V 0.3602729 0.321398 0.1754021 0.2411069	Weight 7.6% 9.5% 31.9% 16.9%	Odds Ratio IV, Fixed, 95% CI 0.77 [0.38, 1.56] 0.75 [0.40, 1.41] 1.25 [0.89, 1.76] 1.32 [0.82, 2.12]	Odds	Ratio and similar te	
Vegetable: OR=1.10, [95%CI 0.9 Study or Subgroup Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b Christopher Spankovich 2017 Diana Tang 2021a Diana Tang 2021b	91,1.34], I ² =0% p= log[Odds Ratio] -0.2613648 -0.2876821 0.2231435 0.2776318 -0.0304592	=0.33 SE V 0.3602729 0.321398 0.1754021 0.2411069 0.2437529	Weight 7.6% 9.5% 31.9% 16.9% 16.5%	Odds Ratio IV, Fixed, 95% CI 0.77 [0.38, 1.56] 0.75 [0.40, 1.41] 1.25 [0.89, 1.76] 1.32 [0.82, 2.12] 0.97 [0.60, 1.56]	Odds	Ratio and similar te	
Vegetable: OR=1.10, [95%CI 0.9 Study or Subgroup Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b Christopher Spankovich 2017 Diana Tang 2021a	91,1.34], I ² =0% p= log[Odds Ratio] -0.2613648 -0.2876821 0.2231435 0.2776318 -0.0304592	=0.33 SE V 0.3602729 0.321398 0.1754021 0.2411069 0.2437529	Weight 7.6% 9.5% 31.9% 16.9% 16.5%	Odds Ratio IV, Fixed, 95% CI 0.77 [0.38, 1.56] 0.75 [0.40, 1.41] 1.25 [0.89, 1.76] 1.32 [0.82, 2.12]	Odds	ing, and similar technolog	
Vegetable: OR=1.10, [95%CI 0.9 Study or Subgroup Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b Christopher Spankovich 2017 Diana Tang 2021a Diana Tang 2021b Diana Tang 2021c	91,1.34], I ² =0% p= log[Odds Ratio] -0.2613648 -0.2876821 0.2231435 0.2776318 -0.0304592	SE V 0.3602729 0.321398 0.1754021 0.2411069 0.2437529 0.2357803	Weight 7.6% 9.5% 31.9% 16.9% 16.5% 17.7%	Odds Ratio V, Fixed, 95% CI 0.77 [0.38, 1.56] 0.75 [0.40, 1.41] 1.25 [0.89, 1.76] 1.32 [0.82, 2.12] 0.97 [0.60, 1.56] 1.19 [0.75, 1.89]	Odds	ing, and similar technolog	
Vegetable: OR=1.10, [95%CI 0.9 Study or Subgroup Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b Christopher Spankovich 2017 Diana Tang 2021a Diana Tang 2021b Diana Tang 2021c Total (95% CI)	91,1.34], I ² =0% p= log[Odds Ratio] -0.2613648 -0.2876821 0.2231435 0.2776318 -0.0304592 0.1739534	=0.33 SE V 0.3602729 0.321398 0.1754021 0.2411069 0.2437529 0.2357803	Weight 7.6% 9.5% 31.9% 16.9% 16.5% 17.7%	Odds Ratio IV, Fixed, 95% CI 0.77 [0.38, 1.56] 0.75 [0.40, 1.41] 1.25 [0.89, 1.76] 1.32 [0.82, 2.12] 0.97 [0.60, 1.56]	Odds IV, Fixe	Ratio and similar te	
Vegetable: OR=1.10, [95%CI 0.9 Study or Subgroup Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b Christopher Spankovich 2017 Diana Tang 2021a Diana Tang 2021b Diana Tang 2021c Total (95% CI) Heterogeneity: Chi² = 3.88, df = 5	P1,1.34], I ² =0% p= Iog[Odds Ratio] -0.2613648 -0.2876821 0.2231435 0.2776318 -0.0304592 0.1739534	=0.33 SE V 0.3602729 0.321398 0.1754021 0.2411069 0.2437529 0.2357803	Weight 7.6% 9.5% 31.9% 16.9% 16.5% 17.7%	Odds Ratio V, Fixed, 95% CI 0.77 [0.38, 1.56] 0.75 [0.40, 1.41] 1.25 [0.89, 1.76] 1.32 [0.82, 2.12] 0.97 [0.60, 1.56] 1.19 [0.75, 1.89]	Odds IV, Fixe	ing, and similar technologies. —2	Com/ On May 19 2025 + 5
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Vegetable: OR=1.10, [95%CI 0.9 Study or Subgroup Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b Christopher Spankovich 2017 Diana Tang 2021a Diana Tang 2021b Diana Tang 2021c Total (95% CI) Heterogeneity: Chi² = 3.88, df = 5	P1,1.34], I ² =0% p= Iog[Odds Ratio] -0.2613648 -0.2876821 0.2231435 0.2776318 -0.0304592 0.1739534	=0.33 SE V 0.3602729 0.321398 0.1754021 0.2411069 0.2437529 0.2357803	Weight 7.6% 9.5% 31.9% 16.9% 16.5% 17.7%	Odds Ratio V, Fixed, 95% CI 0.77 [0.38, 1.56] 0.75 [0.40, 1.41] 1.25 [0.89, 1.76] 1.32 [0.82, 2.12] 0.97 [0.60, 1.56] 1.19 [0.75, 1.89]	Odds IV, Fixe	ing, and similar technologies. —2	Com/ On May 19 2025 + 5
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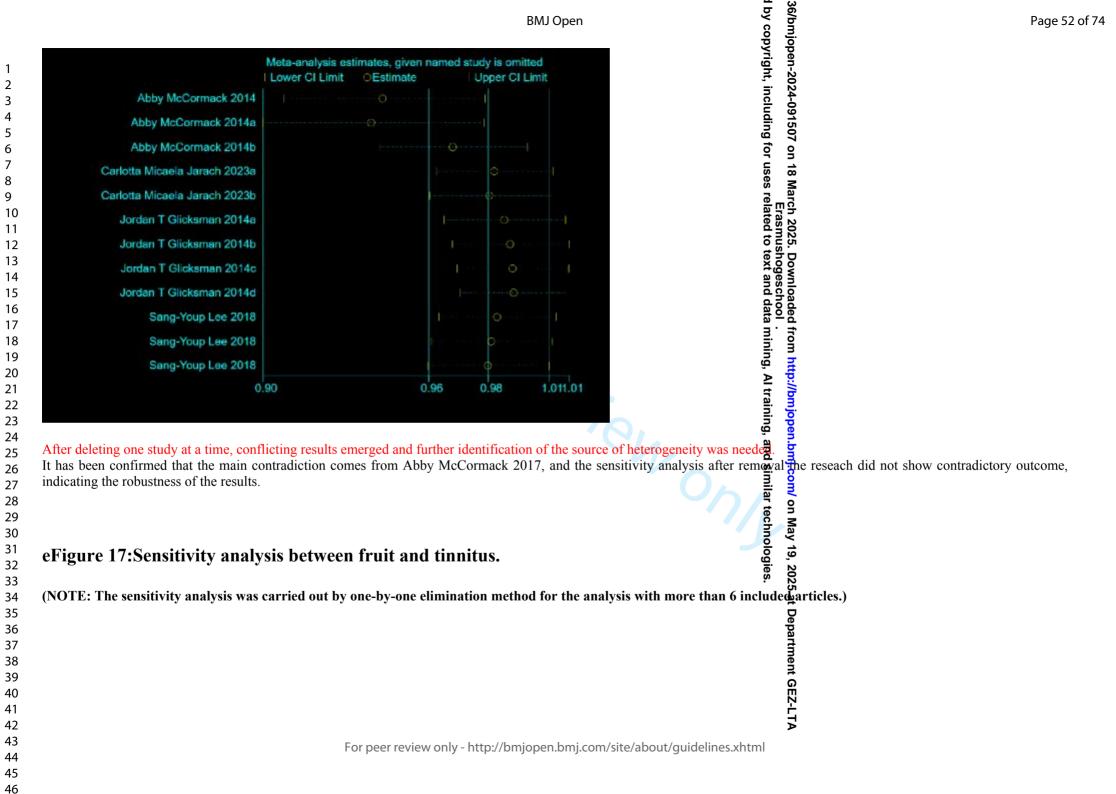
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2 3 4	Study	ES ES	[95% Conf.	Interval] % Weight	including	24-091		
5 6 7 8	Carlotta Micaela Jar Carlotta Micaela Jar Christopher Spankovi Diana Tang 2021a	0.770 0.750 1.250 1.320	0.380 0.399 0.886 0.823	1.560 1.408 1.763 2.117	7.56 9.50 31.89 16.88	ō	` on		
9 10 11	Diana Tang 2021b Diana Tang 2021c	0.970	0.602 0.750	1.564 1.889	16.52 17.65	elated to	rch 202		
12 13 14 15	I-V pooled ES	1.101	0.907	1.337	100.00	o text an	5. Downl		
18 19 20 21 22 23 24 25 26 27 28 29 30	Water: OR=1.00, [95%C1 0.99, Study or Subgroup log Carlotta Micaela Jarach 2023a Doh Young Lee 2018 Milena Tomanic 2020 Total (95% CI) Heterogeneity: Chi² = 2.50, df = 2 (P =	ed pooled odd 1.01], I ² =20% alodds Ratiol -0.1743534 0. 0.0029955 0. 0.1889661 0. = 0.29); F = 20%	ratio (OR) for eac p=0.55. SE Weight IV 3430473 0.0% 0 0055957 99.8% 1 1243716 0.2% 1	h random-effe	een water and tinnitus. eets meta-analysis; Red box sizes in the size of the	=	n.bmj.com/ on May 19,	ned to studies in	the meta- analysis.
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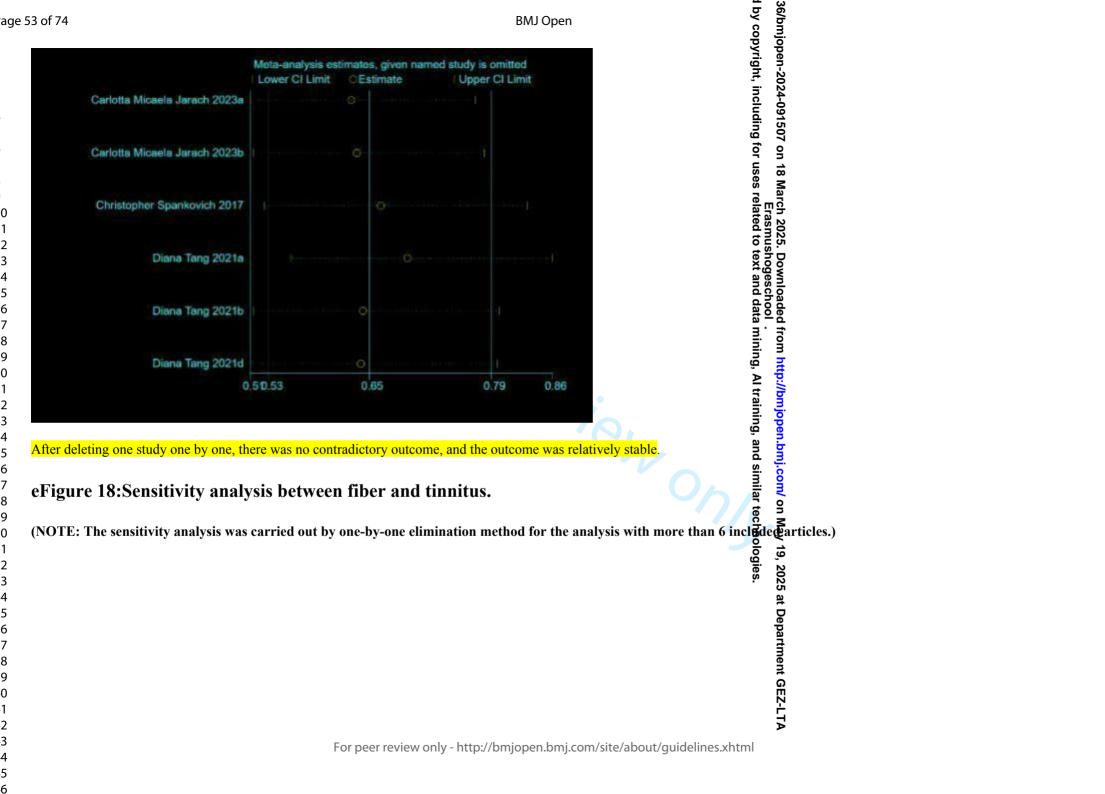
Study or Subgroup	log[Odds Ratio]	SE	Weight	Odds Ratio IV, Fixed, 95% CI		Ratio I, 95% CI
Carlotta Micaela Jarach 2023a	-0.1743534	0.3430473	0.0%	0.84 [0.43, 1.65]	2 2 E	
Doh Young Lee 2018	0.0029955	0.0055957	99.8%	1.00 [0.99, 1.01]		
Milena Tomanic 2020	0.1889661	0.1243716	0.2%	1.21 [0.95, 1.54]	-	
Total (95% CI)			100.0%	1.00 [0.99, 1.01]		
Heterogeneity: Chi ² = 2.50, df = 2	2 (P = 0.29); P = 20°	%			0.5 0.7	15 2
Test for overall effect: Z = 0.59 (F	9 = 0.55)				Favours [experimental]	Favours [control]

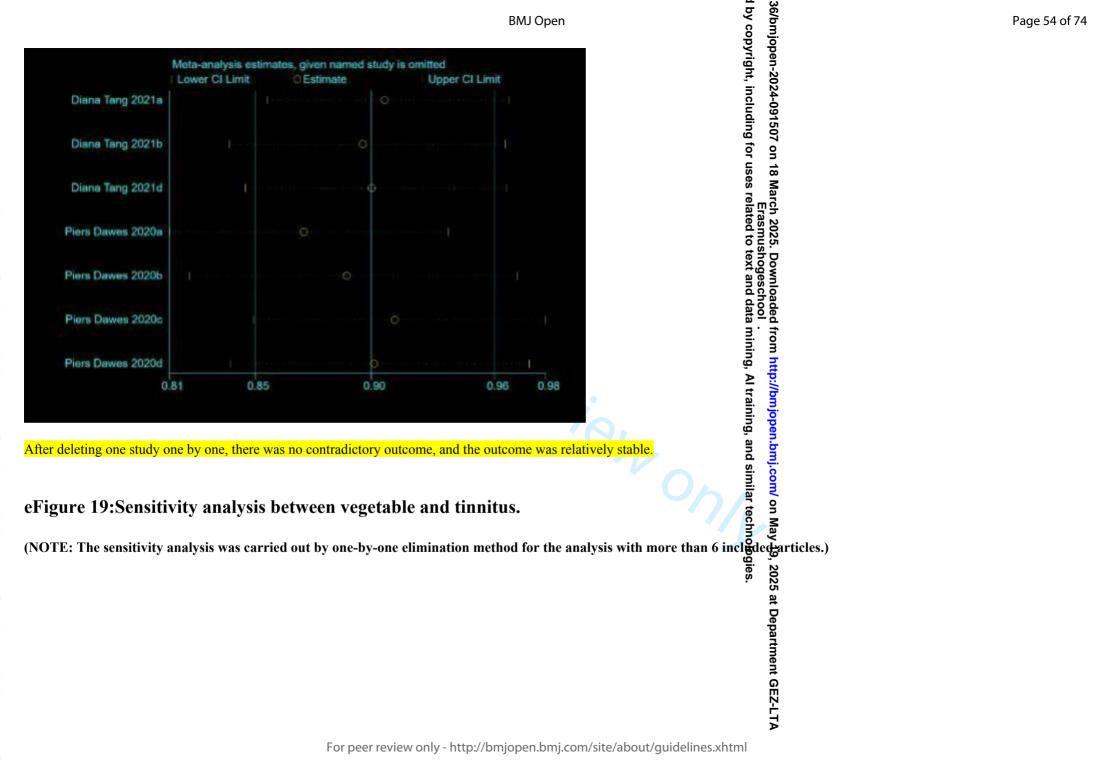
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lilena Tomanic	2020	1.21	.0	0.950	1.541	0.21	arch ; Era relate	
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Figure 15: Forest l	Plot Showii	ng the A	Associati	on Between	dairy and tinnitu	us.	om http:// nining, Al t	
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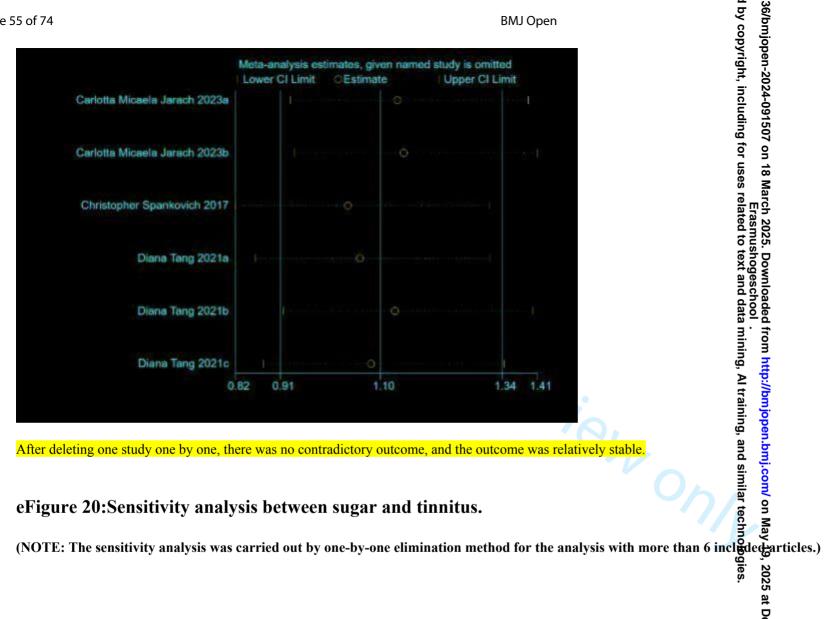
Study or Subgroup	log[Odds Ratio]	SE	Weight	Odds Ratio IV, Fixed, 95% CI	Odds Ratio IV, Fixed, 95% CI
Abby McCormack 2014a	-0.1655144			0.85 [0.75, 0.95]	-
Abby McCormack 2014b	-0.2390169	0.0582753	44.1%	0.79 [0.70, 0.88]	-
Abby McCormack 2014c	-0.1310283	0.1153023	11.3%	0.88 [0.70, 1.10]	-
Christopher Spankovich 2017	-0.0101	0.2069	3.5%	0.99 [0.66, 1.49]	-
Total (95% CI)			100.0%	0.83 [0.77, 0.89]	•
Heterogeneity: Chi ² = 1.89, df=	3 (P = 0.60); F = 09	6		-	05 07 15 1
Test for overall effect: Z = 4.87 (i					0.5 0.7 1 1.5 2 Favours [experimental] Favours [control]

Study	l ES	[95% Conf.	Intervall	% Weight	36/bmjopen-2024-091507 on 18 March 2025. Downlo Erasmushogesc by copyright, including for uses related to text and
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Abby McCormack 2014a					8 M. ses
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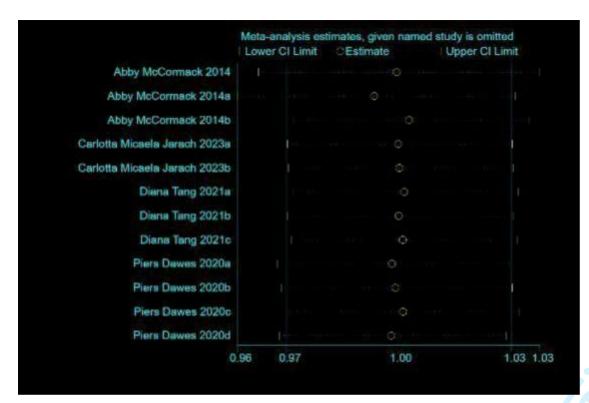






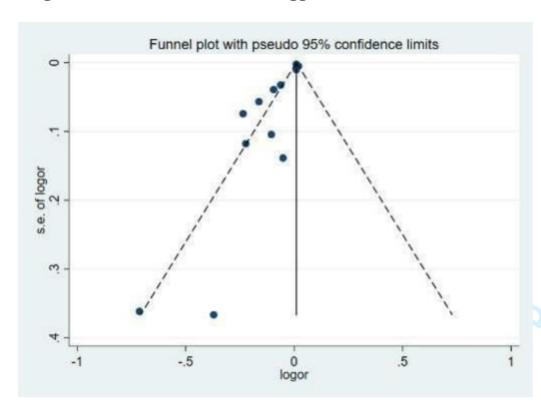


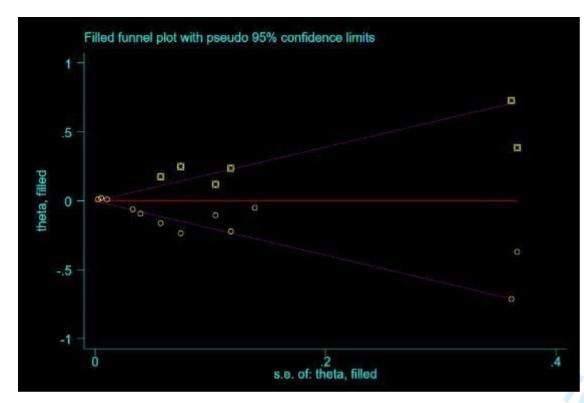
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After deleting one study one by one, there was no contradictory outcome, and the outcome was relatively stable.

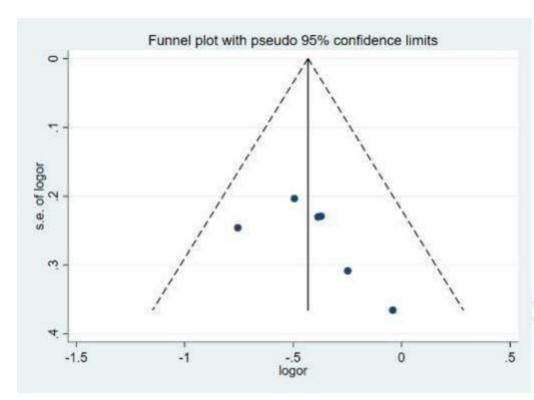
eFigure 21:Publication bias and Egger test on caffeine





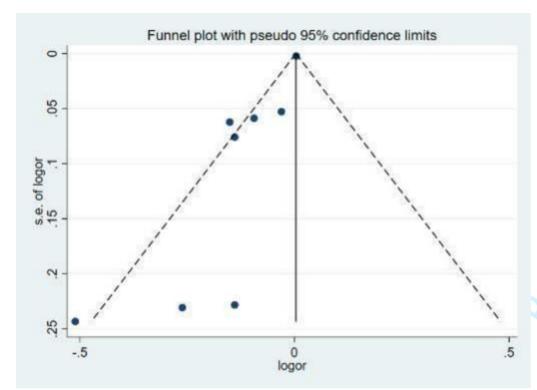
Cut and complement method tips, there was no significant publication bias.

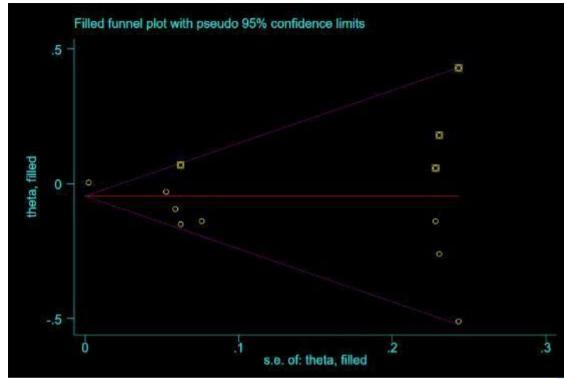
eFigure 22: Publication bias and Egger test on fruit



Egger test: Fruit p=0.205>0.05, there was no significant publication bias.

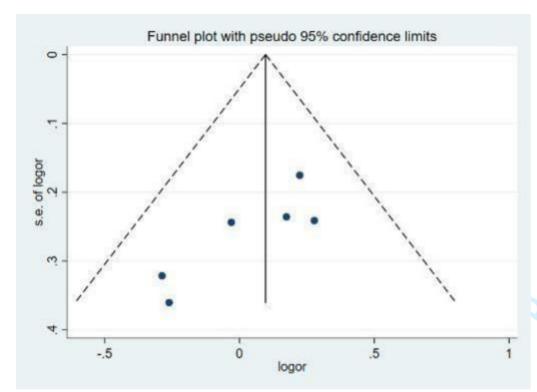
eFigure 23:Publication bias and Egger test on fiber

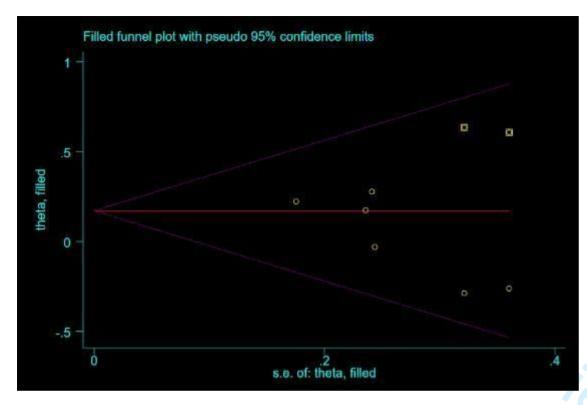




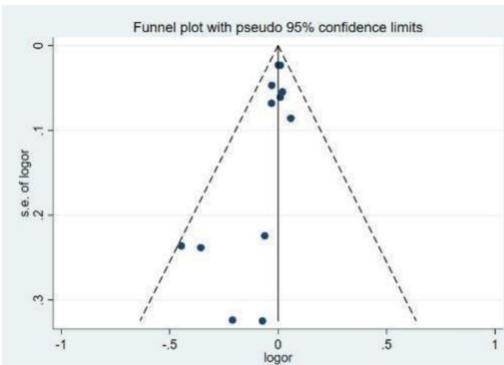
Egger test: Fruit p=0.006<0.05. Cut and complement method tips, there was no significant publication bias.

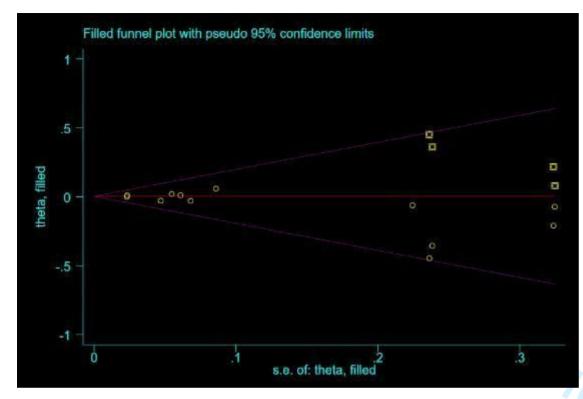
eFigure 24:Publication bias and Egger test on vegetable.





Egger test: Fruit p=0.041<0.05. Cut and complement method tips, there was no significant publication bias.





Egger test: Fruit p=0.035<0.05. Cut and complement method tips, there was no significant publication bias.

 Egger test: Fat p=0.306>0.05, there was no significant publication bias.

eTable 1. Meta-analysis of Observational Studies in Epidemiology (MOOSE) Checklist

Item No.	Recommendation g t	Reported on Page No
Repor	ting of background should include	
1		3-5
2	Problem definition Hypothesis statement Description of study outcome(s)	3-5
3	Description of study outcome(s)	3-5
4	Type of exposure or intervention used Type of study designs used	3-5
5	Type of study designs used	-
6	Study population	5
Repor	ting of search strategy should include	
7	Qualifications of searchers (eg, librarians and investigators)	6
8	Search strategy, including time period included in the synthesis and keywords	6
9	Effort to include all available studies, including contact with authors	6, 7
10	Databases and registries searched	5,6
11	Search software used, name and version, including special features used (eg, explosion)	8
12	Use of hand searching (eg, reference lists of obtained articles)	6
13		6, Fig 1
14	List of citations located and those excluded, including justification Method of addressing articles published in languages other than English	7
15	Method of handling abstracts and unpublished studies	6, 7
16	Description of any contact with authors	-
Repor	ting of methods should include	
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	BMJ Open BMJ Open BMJ Open BMJ Open Description of relevance or appropriateness of studies assembled for assessing the hypothesis to be tested directly and the studies assembled for assessing the hypothesis to be tested of the studies assembled for assessing the hypothesis to be tested of the studies assembled for assessing the hypothesis to be tested of the studies assembled for assessing the hypothesis to be tested of the studies assembled for assessing the hypothesis to be tested of the studies assembled for assessing the hypothesis to be tested of the studies assembled for assessing the hypothesis to be tested of the studies assembled for assessing the hypothesis to be tested of the studies assembled for assessing the hypothesis to be tested of the studies assembled for assessing the hypothesis to be tested of the studies assembled for assessing the hypothesis to be tested of the studies assembled for assessing the hypothesis to be tested of the studies assembled for assessing the hypothesis to be tested of the studies assembled for assessing the hypothesis to be tested of the studies assembled for assessing the hypothesis to be tested of the studies assembled for assessing the hypothesis to be tested of the studies as the	
47	Description of relevance or appropriateness of studies assembled for assessing the hypothesis to be tested in the hypothesis to be the hypothe	8
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18	Rationale for the selection and coding or data (eg, sound clinical principles of convenience)	7-8
19		7
20	Assessment of confounding tea, combarability of cases and controls in studies where appropriate $\frac{1}{2}$	7
21	Assessment of study quality, including blinding of quality assessors, stratification or regression on possible study results Assessment of heterogeneity	7
22	Assessment of heterogeneity	8
23	Description of statistical methods (eg, complete description of fixed or random effects models, justification of which the	8
	chosen models account for predictors of study results, dose-response models, or cumulative meta-analysis) ជាទី១ ពី detail to be replicated	
24	Provision of appropriate tables and graphics	Table 1, Fig
Repo	rting of results should include Graphic summarizing individual study estimates and overall estimate Table giving descriptive information for each study included	
25	Graphic summarizing individual study estimates and overall estimate	Fig 2, Table 1
26	Table giving descriptive information for each study included	eTable2
27	Results of sensitivity testing (eg, subgroup analysis)	eFig16-20
28	Indication of statistical uncertainty of findings rting of discussion should include	10,11
Repo	rung or discussion should include	
29	Quantitative assessment of bias (eg, publication bias)	eFig21-26
30	Justification for exclusion (eg, exclusion of non-English language citations)	Fig 1
31	Assessment of quality of included studies	eTable 5
Repo	rting of conclusions should include	
32	Consideration of alternative explanations for observed results	11-19
33	Generalization of the conclusions (ie, appropriate for the data presented and within the domain of the literature ⊯aview)	11-19

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34	Guidelines for future research	oen- ∕righ	19-20
35	Disclosure of funding source	202, it, in	1

eTable 2: Dietary risk ratio associated with tinnitus

55 Disclosure of furfalling source						
eTable 2: Dietary risk ra	tio associated wit	h tinnitus			24-091507 on 18 March 2025. Downloaded 4 Erasmushogeschool including for uses related to text and data	
Carlotta Micaela Jarach 2023a	scarce	butter	tinnitus	0.98	0. 3 4 ar	1.77
Carlotta Micaela Jarach 2023b	normal use or high use	butter	tinnitus	0.46	ch 202 Eraşm lated t	0.93
Diana Tang 2021a	2nd quartile (>188.4–231.7)	carbohydrate	tinnitus	0.74	5. Dow ushog o text	1.17
Diana Tang 2021b	3rd quartile (231.8– 280.8)	carbohydrate	tinnitus	0.739	/nloade eschoo antida	1.15
Diana Tang 2021c	4th quartile (>280.8– 577.7)	carbohydrate	tinnitus	0.55	0 3 4 from	0.9
Doh Young Lee 2018	direct	carbohydrate	tinnitus	1.001	0.899	1.001
Piers Dawes 2020a	quintile 2	Carbohydrate	tinnitus	1.03	0. 2 4	1.14
Piers Dawes 2020b	quintile 3	Carbohydrate	tinnitus	0.98	0 <u>3</u> 8	1.11
Piers Dawes 2020c	quintile 4	Carbohydrate	tinnitus	0.99	0.396 pp 0.378 n. 0.33 m.	1.14
Piers Dawes 2020d	quintile 5	Carbohydrate	tinnitus	0.93	0 3 8 2	1.1
Carlotta Micaela Jarach 2023a	50-100g/week	cheese	tinnitus	1.29	0.33 3	2.67
Carlotta Micaela Jarach 2023b	100+g/week	cheese	tinnitus	0.85	0 % 6 8	1.58
Abby McCormack 2014	direct	coffee	Transient tinnitus	1.020	1.400	1.031
Abby McCormack 2014a	direct	coffee	Persistent tinnitus	1.010	1.610 on	1.020
Abby McCormack 2014b	direct	coffee	Bothersome tinnitus	1.010	0.3902	1.031
Carlotta Micaela Jarach 2023a	2nd quartile (850- 1749mg)	coffee	tinnitus	0.49	0109les.	0.99
Carlotta Micaela Jarach 2023b	3rd quartile (≥1750mg)	coffee	tinnitus	0.69	0.34	1.43
Jordan T Glicksman 2014a	150-299 mg/day	coffee	tinnitus	0.94	0.88 e	1
Jordan T Glicksman 2014b	300-449 mg/day	coffee	tinnitus	0.91	0.84 쿸	0.98
Jordan T Glicksman 2014c	450-599 mg/day	coffee	tinnitus	0.85	0.76	0.95

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Jordan T Glicksman 2014d	600+ mg/day	coffee	tinnitus	0.79	0 .≩ 8 e g	0.91
Sang-Youp Lee 2018	Age 19–39 (Daily)	coffee	tinnitus	0.8	-2024-0 ht;4nc	1
Sang-Youp Lee 2018	Age 40-64 (Daily)	coffee	tinnitus	0.9	0 2 3 91 3	1.1
Sang-Youp Lee 2018	Age >65 (Daily)	coffee	tinnitus	0.95	0.000 2 0.000	1.24
Abby McCormack 2014	direct	dairy	Transient tinnitus	0.847	0.952 🖺	0.752
Abby McCormack 2014a	direct	dairy	Persistent tinnitus	0.787	0. ₹ 85 ≅	0.704
Abby McCormack 2014b	direct	dairy	Bothersome tinnitus	0.877	1. 6 99 a	0.699
Christopher Spankovich 2017	direct	dairy	Persistent tinnitus	0.99	0호[[] 오	1.50
Carlotta Micaela Jarach 2023a	16-19	diversity	tinnitus	0.53	0. 2 83	1
Carlotta Micaela Jarach 2023b	≥20	diversity	tinnitus	0.47	0.245.0	0.9
Abby McCormack 2014	direct	egg	Transient tinnitus	1.031	March 2025. Downloaded from SEcasmushouseschool Selated to text and dataminit	0.926
Abby McCormack 2014a	direct	egg	Persistent tinnitus	1.149	1.298	1.031
Abby McCormack 2014b	direct	egg	Bothersome tinnitus	0.901	1. 2 8 8	0.719
Carlotta Micaela Jarach 2023a	1/week	eggs	tinnitus	0.99	0.31 =	1.92
Carlotta Micaela Jarach 2023b	2+/week	eggs	tinnitus	0.54	0 ₹ 9 🖁	1
Christopher Spankovich 2017	direct	fat	Persistent tinnitus	0.69	0949	0.99
Doh Young Lee 2018	direct	fat	tinnitus	1.003	1. 🗖 1 💺	1.005
Piers Dawes 2020a	quintile 2	fat	tinnitus	1.06	0.25 3	1.19
Piers Dawes 2020b	quintile 3	fat	tinnitus	1.09	0 .3 5 🖁	1.25
Piers Dawes 2020c	quintile 4	fat	tinnitus	1.19	1 👰 1 👼	1.40
Piers Dawes 2020d	quintile 5	fat	tinnitus	1.33	1 .5 9 🔼	1.62
Diana Tang 2021a	2nd quartile (>17.8– 23.8)	fiber	tinnitus	0.6	o com/ o	0.96
Diana Tang 2021b	3rd quartile (>23.8– 30.6)	fiber	tinnitus	0.87	imitar technologies	1.37
Diana Tang 2021d	4th quartile (>30.6– 89.3)	fiber	tinnitus	0.77	19, 2025 at 0,999 0.999	1.21
Doh Young Lee 2018	direct	fiber	tinnitus	1.004	ور 0.999	1.008
Piers Dawes 2020a	quintile 2	fiber	tinnitus	0.97	0.87	1.07
Piers Dawes 2020b	quintile 3	fiber	tinnitus	0.91	0.81 2	1.02
Piers Dawes 2020c	quintile 4	fiber	tinnitus	0.86	0.76	0.97
Piers Dawes 2020d	quintile 5	fiber	tinnitus	0.87	0.87 De 0.81 par de 0.76 m 0.75 m C	1.01

Abby McCormack 2014	direct	fish	Transient tinnitus	0.980	0. 2 50 g	1.020
Abby McCormack 2014a	direct	fish	Persistent tinnitus	0.910	0.870 2	0.940
Abby McCormack 2014b	direct	fish	Bothersome tinnitus	1.080	0.890 24	1.160
Carlotta Micaela Jarach 2023a	300g/week	fish	tinnitus	1.19	0.0.0.9 91 0.0.1.9 091 0.0.1.1 09	2.38
Carlotta Micaela Jarach 2023b	≥450g/week	fish	tinnitus	0.75		1.4
Carlotta Micaela Jarach 2023a	900-1050g/week	fruit	tinnitus	0.96	0.97 9	1.97
Carlotta Micaela Jarach 2023b	≥1200g/week	fruit	tinnitus	0.78	0 5 3 8 0	1.44
Christopher Spankovich 2017	direct	fruit	Persistent tinnitus	0.61	0 <u>.4</u> 1 Mar	0.91
Diana Tang 2021a	2nd quartile (>3.6–6.2)	fruit	tinnitus	0.47	ch 202 Eraşım lated	0.76
Diana Tang 2021b	3rd quartile (>6.2– 9.7)	fruit	tinnitus	0.68	18 March 2025. Downloaded Erasmushogeschool Usestelated to text and data O O	1.06
Diana Tang 2021d	4th quartile (>9.7– 43.9)	fruit	tinnitus	0.69	vnload Jescho and d	1.08
Carlotta Micaela Jarach 2023a	scarce	margarine	tinnitus	1.35	0 2 5 8	7.43
Carlotta Micaela Jarach 2023b	normal use or high use	margarine	tinnitus	1.4	ming from http	9.98
Carlotta Micaela Jarach 2023a	300g/week	meat	tinnitus	1.49	0. 7 5 =	2.94
Carlotta Micaela Jarach 2023b	≥450g/week	meat	tinnitus	0.97	0.51	1.85
Christopher Spankovich 2017	direct	meat	Persistent tinnitus	1.01	0 3 2 👼	1.65
Carlotta Micaela Jarach 2023a	2nt quartile (1-6 cops/week)	milk	tinnitus	0.68	ng 75 llura jopen.bmj.com	1.52
Carlotta Micaela Jarach 2023b	3rt quartile (7+ cops/week)	milk	tinnitus	0.85		1.55
Doh Young Lee 2018	direct	protein	tinnitus	1.002	1.001 3	1.004
Piers Dawes 2020a	quintile 2	protein	tinnitus	1.02	0 § 2 §	1.14
Piers Dawes 2020b	quintile 3	protein	tinnitus	1.01	099 19, 2025 099 0995 099 099	1.13
Piers Dawes 2020c	quintile 4	protein	tinnitus	0.97	0.85 %	1.11
Piers Dawes 2020d	quintile 5	protein	tinnitus	1.06		1.26
Abby McCormack 2014	direct	suger	Transient tinnitus	1.000	0.952	1.042
Abby McCormack 2014a	direct	suger	Persistent tinnitus	1.010	0.971	1.064
Abby McCormack 2014b	direct	suger	Bothersome tinnitus	0.971	0.885	1.064
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Carlotta Micaela Jarach 2023a	2nt quartile (1-7 spoon/week)	suger	tinnitus	0.93	open-20 pyright,	1.75
Carlotta Micaela Jarach 2023b	3rt quartile (8+ spoon/week)	suger	tinnitus	0.81	open-2024-091507 on 18 M pyrignt, inc∰uding∑or uses	1.53
Diana Tang 2021a	2nd quartile (>91.0– 120.1)	suger	tinnitus	0.64	507 on îng <u>Ť</u> or	1.01
Diana Tang 2021b	3rd quartile (>120.1– 154.0)	suger	tinnitus	0.94	18 Mai uses r	1.47
Diana Tang 2021c	4th quartile (>154.0– 350.8)	suger	tinnitus	0.7	March 2025. Downloaded fro	1.12
Piers Dawes 2020a	quintile 2	suger	tinnitus	1.02	0.925.5	1.14
Piers Dawes 2020b	quintile 3	suger	tinnitus	1.01	0 0 0 0 0 0 0 0	1.13
Piers Dawes 2020c	quintile 4	suger	tinnitus	0.97	0 ang	1.11
Piers Dawes 2020d	quintile 5	suger	tinnitus	1.06	ade hoc Ba	1.26
Christopher Spankovich 2017	direct	variety	Persistent tinnitus	0.95	0.50 ()	1.5
Carlotta Micaela Jarach 2023a	900-1050g/week	vegetable	tinnitus	0.77	U <u>3.</u> 8 3	1.56
Carlotta Micaela Jarach 2023b	≥1200g/week	vegetable	tinnitus	0.75	nga Hat	1.41
Christopher Spankovich 2017	direct	vegetable	Persistent tinnitus	1.25	http://	1.79
Diana Tang 2021a	2nd quartile (>7.2– 9.7)	vegetable	tinnitus	1.32	0 mjop	2.11
Diana Tang 2021b	3rd quartile (>9.7– 12.3)	vegetable	tinnitus	0.97	tranning, and	1.56
Diana Tang 2021c	4th quartile (>12.3– 54.5)	vegetable	tinnitus	1.19	0 15 m	1.89
Abby McCormack 2014	direct	vegetable and fruit	Transient tinnitus	1.000	1.0800 =	1.010
Abby McCormack 2014a	direct	vegetable and fruit	Persistent tinnitus	1.010	1.∰300 ≦	1.010
Abby McCormack 2014b	direct	vegetable and fruit	Bothersome tinnitus	1.010	1.600 3	1.020
Carlotta Micaela Jarach 2023a	>1 liter/per day	water	tinnitus	0.84	0.992 5	1.65
Doh Young Lee 2018	direct	water	tinnitus	1.003	0.992 25	1.014
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eTable 3. Evalua	ition of Risk	x of Bias Us	sing Nev	vcastle-0		MJ Open Scale (1	NOS) fo	r Observ	~ 5	S
Study	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8		Total
Carlotta Micaela Jarach 2023	*	*	*_	*	*	*	*	*	arch 2625. Downloaded from http://bmjoper Erasmushogeschool related text and data mining, Al training,	8
Diana Tang 2021	*	*	*		*	*	*	*	load scho d di	8
Milena Tomanic 2020	*	*	*	6	0.		*		ed from	4
Piers Dawes 2020	*	*	*		*	*	*		n ht	6
Sang-Yeon Lee 2019	*	*	*		*	*	*		tp://bn , Al tra	6
Doh Young Lee 2018	*	*	*		*	*	*		njoper ining,	6
Sang-Youp Lee 2018	*	*	*		*	*	*		and si	6
Christopher Spankovich 2017	*	*	*		*	*	*	O	p://bmjopen.bmj.dom/ on May 19, 202 * Al training, and similar technologies.	6
Abby McCormack 2014	*	*	*		*	*	*		May 1	6
Jordan T Glicksman 2014	*	*	*		*	*	*		19, 2025 * plogies.	7

eTable 4. Literature screening process

eTable 4. Literature screening process	BMJ Open	36/bmjopen-2024-09150g og
Title	Author	mora u c
The Role of Diet in Tinnitus Onset: A Hospital-Based Case-Control Study from Italy.	Carlotta Micaela Jarach 2023	18 March 2025. E Erashius uses related to t
Associations between intake of dietary flavonoids and the 10-year incidence of tinnitus in older adults.	Diana Tang 2022	h 2025. ira≰anus ated to
Dietary Fibre Intake and the 10-Year Incidence of Tinnitus in Older Adults.	Diana Tang 2021	is. Downless text and
Relationship Between Diet, Tinnitus, and Hearing Difficulties.	Piers Dawes 2020	0 2d 0 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
Association of Chocolate Consumption with Hearing Loss and Tinnitus in Middle-Aged People Based on the Korean National Health and Nutrition Examination Survey 2012-2013.	Sang-Yeon Lee 2019	Downloaded from http://bm/jopeophmj.com/ on May 19,2025 at Department shogeschaol . E E E E E E E Z Z text and data mirring, AI training/and similar technologies.
Relationship Between Diet and Tinnitus: Korea National Health and Nutrition Examination Survey.	Doh Young Lee 2018	p://bmjc Al traini
Association of Coffee Consumption with Hearing and Tinnitus Based on a National Population-Based Survey	Sang-Youp Lee 2018	pegobr E Ing/anc
Relationship between dietary quality, tinnitus and hearing level: data from the national health and nutrition examination survey, 1999-2002.	Christopher Spankovich 2017	nj.com/ E Isimmila
Association of dietary factors with presence and severity of tinnitus in a middle-aged UK population.	Abby McCormack 2014	on May E r techno
A prospective study of caffeine intake and risk of incident tinnitus	Jordan T. Glicksman 2014	19,202 E blogtes.
The effect of MemoVigor 2 on recent-onset idiopathic tinnitus: a randomized double-blind placebo-controlled clinical trial.	Dimitrios G Balatsouras 2024	5 at Del
The effects of dietary and physical activity interventions on tinnitus symptoms: An RCT.	Ümüş Özbey-Yücel 2023	oartmen No

Effectiveness of Tinnitan Duo in Subjective Tinnitus with Emotional Affectation: A Prospective, Interventional Study.	Jennifer Knäpper 2023	pen-202 yright, i
Hyperlipidemia and its relation with tinnitus: Cross-sectional approach.	A Musleh 2022	24-091 nclud
Diet Quality and the Risk of Impaired Speech Reception Threshold in Noise: The UK Biobank cohort	Humberto Yévenes-Briones 2022	91507 o Jding fo
The effect of caffeine on tinnitus: Randomized triple-blind placebo- controlled clinical trial.	Alleluia Lima Losno Ledesma 2021	n 18 Ma r uses ı
The effects of diet and physical activity induced weight loss on the severity of tinnitus and quality of life: A randomized controlled trial.	Ümüş Özbey-Yücel 2021	rch 202 Erasm elated
Dietary Factors and Tinnitus among Adolescents.	Milena Tomanic 2020	6 40 C
Restriction of salt, caffeine and alcohol intake for the treatment of Ménière's disease or syndrome.	Kiran Hussain 2018	ownloa ogesch ext and
The effect of supplemental dietary taurine on tinnitus and auditory discrimination in an animal model.	Thomas J Brozoski 2010	ded fro
Low energy diet and intracranial pressure in women with idiopathic intracranial hypertension: prospective cohort study.	Alexandra J Sinclair 2010	m http:: ning, Al
Caffeine abstinence: an ineffective and potentially distressing tinnitus therapy.	Lindsay St Claire 2010	//bmjopen
The role of endogenous Antisecretory Factor (AF) in the treatment of Meniere's Disease: A two-year follow-up study. Preliminary results.	Pasquale Viola 2020	and s
Caffeine intake and Meniere's disease: Is there relationship?	Inés Sánchez-Seller 2018	§ No <mark>€</mark>
Tinnitus features according to caffeine consumption.	Ricardo Rodrigues Figueiredo 2021	lar
The Influence of Diet on Tinnitus Severity: Results of a Large-Scale, Online Survey	Steven C. Marcrum 2022	ng May 19, 202

BMJ Open

Association of fifteen common dietary factors with tinnitus: a systematic review and meta-analysis of observational studies

Journal:	BMJ Open
Manuscript ID	bmjopen-2024-091507.R1
Article Type:	Original research
Date Submitted by the Author:	19-Dec-2024
Complete List of Authors:	Zhang, Mengni; Chengdu University of Traditional Chinese Medicine, Wang, Xiaocui; Hospital of Chengdu University of Traditional Chinese Medicine Zhang, Shipeng; Hospital of Chengdu University of Traditional Chinese Medicine, He, Xinyi; Chengdu University of Traditional Chinese Medicine Chen, Xi; Hospital of Chengdu University of Traditional Chinese Medicine Wang, Lu; Hospital of Chengdu University of Traditional Chinese Medicine Fu, Li; Hospital of Chengdu University of Traditional Chinese Medicine wang, hanyu; Chengdu University of Traditional Chinese Medicine Fu, Qinwei; Hospital of Chengdu University of Traditional Chinese Medicine jiang, yanjie; Nanjing University of Chinese Medicine Li, Xinrong; Hospital of Chengdu University of Traditional Chinese Medicine Zhang, Qinxiu; Chengdu University of Traditional Chinese Medicine, Hospital of Chengdu University of Traditional Chinese Medicine; Chengdu University of Traditional Chinese Medicine; Chengdu University of Traditional Chinese Medicine; Chengdu University of Traditional Chinese Medicine, School of Medical and Life Sciences
Primary Subject Heading :	Ear, nose and throat/otolaryngology
Secondary Subject Heading:	Nutrition and metabolism
Keywords:	OTOLARYNGOLOGY, NUTRITION & DIETETICS, Meta-Analysis, Neurotology < OTOLARYNGOLOGY

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1	Association	of fifteen	common	dietary	factors	with

- tinnitus: a systematic review and meta-analysis of
- 3 observational studies
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- 5 D) 1+, Xingyi He (MMed)1, Xi Chen (MMed)1, Lu Wang (Ph. D)1, Li Fu
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- 19 Mengni Zhang, Shipeng Zhang and Xiaocui Wang are Co-first author.
- 21 Abstract

22 Objective: A systematic analysis was conducted to investigate the

 association between tinnitus prevalence and daily dietary patterns.

Methods: The PubMed, Embase, Web of Science, and Cochrane Library databases underwent searches from their inception to May 25, 2024. Two evaluators, blinded to the studies, chose observational studies from peerreviewed English-language journals. These studies examined tinnitus presence or severity in adults aged 18 or older, including associated prevalence estimates. Data extraction was independently conducted by two assessed research bias using the Agency for evaluators, who Newcastle-Ottawa Scale (NOS) and applied evidence classification criteria for aggregate grade strength assessment. This study adhered to the guidelines of the Preferred Reporting Project (PRISMA) and Meta-Analysis of Epidemiological Observational Studies (MOOSE), as well as the PROSPERO Registry protocols. A mixed-effects model combined maximum adjusted estimates, with heterogeneity measured using the I² statistic. Sensitivity analysis validated the analysis's robustness, while publication bias was assessed qualitatively and quantitatively. **Results:** A total of 10 retrospective studies were identified and included in this analysis, with the last eight studies incorporated into the meta–analysis. Fifteen dietary factors were examined. Fruit intake, dietary fiber, caffeine, and dairy product consumption showed negative correlations with tinnitus prevalence (OR = 0.649, [95% CI 0.532, 0.793], p<0.0001), (OR = 0.918,

[95% CI 0.851, 0.990], p = 0.03), (OR = 0.898, [95% CI 0.862, 0.935], p

- <0.00001), (OR = 0.827, [95% CI, 0.766 to 0.892], p <0.00001),
- respectively. A sensitivity analysis affirmed the robustness of the findings.
- **Conclusions:** The systematic review and meta-analysis findings suggest a
- link between particular dietary elements and a lower occurrence of tinnitus.
- **Keywords:** Diet; Tinnitus; Food intake; Nutrition; Odds ratio

STRENGTHS AND LIMITATIONS OF THIS STUDY

- This study conducted a thorough literature screening, assessed the quality of the literature based on international standards, and excluded articles with a high risk of bias.
- This review involved a large population base, improving its representation of fundamental population characteristics and ensuring relatively reliable outcomes.
- There was minimal heterogeneity among the studies regarding the main
 observations, ensuring the solidity of the findings.
- The relatively small number of included articles may have led to certain conventionally accepted as beneficial dietary factors (such as vegetables and eggs) not demonstrating significant differences. In addition, due to limited data in the original literature, a dose-effect meta-analysis cannot be supported.
- The majority of included articles were cross-sectional studies, underscoring the necessity for further cohort studies or Mendelian

 randomization studies to investigate causal relationships and provide additional clinical evidence for the dietary prevention of tinnitus.

Introduction

Tinnitus, characterized by perceived sounds such as buzzing, cicadas, or electric currents, occurs without external auditory stimuli ¹. It is associated with distress, depression, anxiety, stress, and, in severe cases, suicide, significantly affecting overall quality of life² ³. Recent epidemiological data suggests a global pooled prevalence of around 14.4% in adults and 13.6% in children and adolescents⁴. The notable prevalence of tinnitus and its substantial impact on life and mental well-being have increasingly become a significant medical and societal concern⁵. The origins of tinnitus remain elusive and involve a range of factors. Some researchers have suggested neural dysfunction or circulatory issues in the inner ear, abnormal neuronal activity in central auditory pathways, and irregular activity in nonauditory brain regions like the anterior insula, anterior cingulate cortex, and thalamus⁶. In clinical practice, treatments for tinnitus include psychological management counseling, cognitive—behavioral therapy, tinnitus retraining therapy, sound therapy, pharmacological interventions, non-pharmacological surgery, interventions (including electrical stimulation, repetitive transcranial magnetic stimulation, nerve block, bimodal neuromodulation, tinnitus

 retraining therapy et al.), as well as hearing aids and cochlear implants for patients with a relevant hearing loss⁷⁸. Due to an incomplete understanding of central neuropathological mechanisms, no single treatment universally meets the needs of all patients⁹ 10. The role of diet in tinnitus has been identified as a research priority by both patients and physicians. In recent years, the need for nutritional treatment programs for chronic tinnitus has increased. Diet can have a significant impact on tinnitus, but the exact connection between diet and tinnitus is unclear¹¹. A population study investigating the correlation between diet and tinnitus among UK adults found a decrease in tinnitus occurrence with higher fruit and vegetable consumption. Conversely, avoiding dairy was linked to a higher risk of tinnitus. On the other hand, abstaining from eggs, adding fish to the diet, and consuming caffeinated beverages were suggested to potentially lower the risk of tinnitus ². Another study in British adults showed that higher fat intake was associated with a greater likelihood of experiencing tinnitus¹¹. Similarly, Lee and Kim identified risk factors for tinnitus, including low water, protein, riboflavin, and niacin intake, although this was unrelated to fruit and vegetable consumption¹². It is thought that intake of high-quality nutrients through food can have a positive effect on the hearing system by improving blood flow to the cochlea, reducing oxidative damage and reducing inflammation. In

contrast, high saturated fat intake may increase the risk of tinnitus through

 cardiovascular pathways¹¹ ¹³. Tang et al. ¹⁴ found that inadequate fruit fiber (<3.6 g/day) and grain fiber (<4.2 g/day) intake were linked to a 65% and 54% increased risk of developing tinnitus over the next decade, respectively. Conflicting results have hindered researchers' ability to understand the potential benefits of diet; hence, a systematic review on the relationship between diet and tinnitus is needed.

As of now, there has not been a comprehensive examination through systematic reviews or meta-analyses regarding the link between typical

systematic reviews or meta-analyses regarding the link between typical dietary patterns and tinnitus. Our objective was to systematically explore this association while accounting for potential confounding variables. The study aimed to furnish clinical evidence to inform the development of dietary prevention approaches for tinnitus.

Method

According to the guidelines of the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA), a set of evidence-based standards for the research quality of systematic reviews, apply to published reviews of literature that contain primary data sources and aim to improve the scientific rigor of systematic reviews¹⁵, the protocol for this study was appropriately registered on PROSPERO under the registration number CRD42023493856. Additionally, my reporting is guided by the Meta-analysis of Observational Studies in Epidemiology (MOOSE) standards for

epidemiological observational studies, which was developed by a group of experts to improve the quality and transparency of Meta-analysis and Systematic Evaluation of Observational Studies, contributing to the scientific validity and credibility of such studies, as referenced ¹⁶. **Supplemental eTable 1** contains the MOOSE listings, while Supplemental 2 outlines the PRISMA instructions.

Search Strategy

 We developed an inclusive search strategy covering diet-related and tinnitus-related subjects to capture pertinent literature from the PubMed, Embase, Web of Science, and Cochrane Library databases. The research design was limited to systematic evaluation. There were no language restrictions imposed on the search, and we considered articles published before May 25, 2024. For publications in unknown languages, we proceed through specialized translation software. The search strategy was designed to identify studies linking tinnitus and diet, and two specific terms 'Tinnitus' and 'Diet' come from Medical Subject Headings (MeSH) Major Topic were identified. The databases were systematically explored using a blend of MeSH terms, keywords, and various text word variations related to diet, following the guidance outlined by the Scottish Intercollegiate Guidelines Network: ((tinnitus OR Ringing-Buzzing) AND (diet OR food OR water OR milk OR fish OR fruit OR vegetable OR fiber OR sugar OR meat OR margarine OR fat OR egg OR

 variety OR caffeine OR carbohydrate OR protein). The screening process is depicted in **Figure 1.**

The following inclusion criteria were applied: (1) inclusion of cohort, case-control, or cross-sectional studies; (2) inclusion of all individuals in the study population; (3) consideration of various dietary intakes; and (4) investigation of tinnitus as a study outcome provided effect sizes or other data on the association between dietary intake and tinnitus as an outcome. Exclusion criteria comprised: (1) studies involving therapeutic interventions; and (2) randomized controlled trials, animal experiments, cell studies, case reports, literature, and incomplete or invalid sources, and the original literature lacked sufficient data to calculate the risk ratio for tinnitus (some publications do not report effect sizes, but instead allow the raw data to be used to calculate them. In these cases, use RevMan (version 5.3) to calculate the OR). *Data collection*

In **Table 1,** data compilation was conducted by two reviewers (SZ, MZ), including authors' names, participant counts, age spans, survey/diagnosis specifics, and information on food and tinnitus. Given the treatment of dietary intake as a continuous variable, some researchers have typically performed stratified comparisons based on regional intake standards and researchers' characteristics. This strategy aimed to explore the impact of varying levels of increased intake on tinnitus prevalence. For most continuous variables associated with food intake, adjusted OR values were

Table 1: Basic information to be incorporated into the article.

Author	Total	Age	Time frame	Data from	Study design	Diet recording method	Disease diagnosis	Type of diet
Carlotta Micaela Jarach 2023	383	40-65	2016-2019	The Mario Negri Institute in Milan (Italy) , Monza e Brianza, Italy	case control	Self-designed questionnaire	Interviewer administered questionnaire and the Italian validated version of the tinnitus handicap inventory	coffee, eggs, butter, meat, fish, cheese, fruit, vegetable varied diet, dairy, milk
Diana Tang 2022	1217	>50	1997-2009	Blue Mountains Hearing Study	cohort	Semi-quantitative food frequency questionnaire, FFQ	Audiologist administered questionnaire	dietary flavonoids
Diana Tang 2021	1730	>50	1997-2009	Blue Mountains Hearing Study	cohort	Semi-quantitative food frequency questionnaire, FFQ	Audiologist administered questionnaire	carbohydrate, sugar, fiber, fruit, vegetable
Piers Dawes 2020	34576	30-69	2006-2010	UK Biobank resource (Collins 2012).	cross-sectional	Dietary assessment was based on the Oxford Web-Q	An epidemiologic method of hearing investigation	fiber, fat, sugar
Sang-Yeon Lee 2019	3575	40-64	2012-2013	The sixth Korea National Health and Nutrition Examination Survey (KNHANES)	cross-sectional	Food-frequency questionnaire (FFQ)	Self-designed questionnaire	chocolate
Doh Young Lee 2018	7621	40-80	2013-2015	The sixth Korea National Health and Nutrition Examination Survey (KNHANES)	cross-sectional	Diet was assessed with a semi- quantitative food- frequency questionnaire	Self-designed questionnaire	water, protein, fat, carbohydrate, fiber
Sang-Youp Lee 2018	13448	>19	2009-2012	The sixth Korea National Health and Nutrition Examination Survey	cross-sectional	Food-frequency questionnaire (FFQ)	Self-designed questionnaire	coffee
Christopher Spankovich 2017	2176	20-69	1999-2002	NHANES	cross-sectional	Dietary recall interviews were conducted during 1999–2002 NHANES MEC evaluations.	Self-designed questionnaire	fat, fruit, vegetable, mea varied diet
Abby McCormack 2014	171722	40-69	2006-2010	UK Biobank resource (Collins 2012).	cross-sectional	The UK Biobank touchscreen questionnaire	Self-designed questionnaire	fruit, vegetable fish, egg, sugar coffee, dairy
Jordan T. Glicksman 2014	65085	30- 44(regis tered)	1991-2009	The Nurses' Health Study II	cross-sectional	Extensively validated semiquantitative food frequency questionnaires	Self-designed questionnaire	coffee

 assimilated in the meta-analysis when stratified according to dose intake, with the exclusion of the reference group. In cases of direct comparison, the singular adjusted OR value was integrated. Further insights on odds ratios (ORs) are provided in **Supplemental eTable 2**.

Literature quality evaluation

The assessment of individual study quality was conducted by two reviewers (SZ and MZ) using a modified version of the Newcastle–Ottawa Scale. Previous grading categorized studies as having a high (<5 stars), moderate (5–7 stars), or low (≥8 stars) risk of bias (see eTable 3 in the Supplement).

Statistical analysis

Data analysis was performed using RevMan (version 5.3) and Stata (version 15.0). Mixed–effect models were utilized to aggregate maximally covariate-adjusted odds ratios (ORs) across all studies. According to current practice, odds ratios (ORs), relative risks (RRs), and hazard ratios (HRs) are approximately equal when events occur infrequently. For this situation, it is acceptable to include OR, RR, and HR in the same meta-analysis. In cases where the P value of the Q test was <0.10 or the I² statistic exceeded 50%, we conducted an assessment to determine significant interstudy heterogeneity. For observational studies, maximally covariate-adjusted estimates were strongly prioritized. If a study employed an analytical method incongruent with synthesis for the majority of other

studies, we either converted the effect estimate to the appropriate combined ratio or excluded the study from the meta-analysis.

In cases of considerable heterogeneity in the analysis with significant differences, meta-regression was utilized to explore the source of heterogeneity (please note: Meta-regression was considered when the data included in the analysis were greater than 10). We visually assessed the asymmetry of the funnel plot and used Egger's bias to detect possible publication bias, with estimation of missing studies conducted using eMethods if publication bias was suspected (please note: Publication bias analysis was considered when the data included in the analysis were greater than 6). Moreover, we conducted a sensitivity analysis of the pooled results employing a one—by—one exclusion method.

Patient and public involvement

Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Results

Literature screening process is depicted in **Supplemental eTable 4**. Ten articles were found in the search² ¹¹ ¹² ¹⁴ ¹⁷⁻²². Among these, two articles delved into individual dietary factors, namely, chocolate ¹⁹ and flavonoids ¹⁸, which were not investigated in other studies. While these two articles were included in the narrative review, they were excluded from the meta-

 223 analysis. The remaining eight articles comprised the dataset for the meta-224 analysis.

226 Eifteen common dietary factors were analyzed, and dietary sources were 226 assessed using validated nutrition/diet questionnaires. The combined 227 findings revealed that four diets (caffeine, fruit, dietary fiber, and dairy 228 products) exhibited a negative association with the prevalence of tinnitus, 229 that is, the higher the intake of caffeine, fruit, dietary fiber, and dairy 230 products, the lower the prevalence of tinnitus.

A meta-analysis of dietary factors

The meta-analysis included eight studies with a total of 301,533 people and analyzed 15 dietary factors, as shown in Figure 2: carbohydrates (2/8, Supplemental eFigure 1), caffeine (4/8, Supplemental eFigure 2), varied diets (2/8, Supplemental eFigure 3), eggs (2/8, Supplemental eFigure 4), fruits (3/9, Supplemental eFigure 5), fiber (2/8, Supplemental eFigure 6), fat (3/8, Supplemental eFigure 7), margarine (2/8, Supplemental eFigure 8), meat (2/8, Supplemental eFigure 9), sugar (4/8, Supplemental eFigure 10), protein (2/8, Supplemental eFigure 11), fish (3/8, Supplemental eFigure 12), vegetables (4/8, Supplemental eFigure 13), water (3/8, Supplemental eFigure 14), and dairy (2/8, Supplemental eFigure 15). The summary results are depicted in Figure 2. Intake of dairy products, fruits, dietary fiber, and caffeine showed negative correlations with the prevalence of tinnitus: 0.827 for dairy [95%]

CI 0.766-0.892], $I^2 = 0\%$, p < 0.00001; 0.649 for fruit [95% CI 0.532-0.793], $I^2 = 0\%$, p < 0.0001; 0.918 for fiber [95% CI 0.851-0.990], $I^2 = 0.000$, p = 0.03; and 0.898 for caffeine [95% CI 0.862-0.935], $I^2 = 23\%$, p < 0.003. Protein intake t increased the risk of tinnitus (OR = 1.002 [95% CI 0.001-1.004], $I^2 = 0\%$, $I^2 = 0.009$). No associations were found between other dietary factors and tinnitus.

Sensitivity analysis

We conducted sensitivity analyses for various dietary intakes based on predefined analysis criteria (requiring data from included articles to exceed 6). Contradictory outcomes were noted in the aggregated results for caffeine (refer to Supplemental eFigure 16), with the analysis attributing these contradictions to data within the same article (Abby McCormack 2014). Sequential exclusion of fruit (refer to Supplemental eFigure 17) and dietary fiber (refer to Supplemental eFigure 18) maintained the statistical significance of the combined odds ratio. Successive exclusion of summary results for vegetables (refer to Supplemental eFigure 19) and sugar (refer to Supplemental eFigure 20) revealed no contradictory outcomes in the combined odds ratio; thus, ensuring the robustness of the meta-analysis results. The comprehensive sensitivity analysis indicated the relative robustness of the meta-analysis results, confirming the association of fruit and dietary fiber intake with the prevalence of tinnitus. No

 significant associations between other dietary intakes and tinnitus were found.

Publication bias

The funnel plot and Egger test findings for caffeine, fruit, vegetables, diet, sugar, and fat indicated the presence of publication bias (**Supplemental** eFigure 21 – 26). We performed a supplementary analysis using the shear compensation method, yielding consistent results that suggest publication bias did not impact the main outcome.

Discussion

In this systematic review and meta-analysis involving eight observational studies (comprising a total of 301,533 participants), we discovered that increased dietary consumption of fruit, dietary fiber, dairy products, and caffeine was associated with a reduced occurrence of tinnitus. These reductions were 35.1% (20.7%–46.8%) for fruit intake, 9.2% (1%–14.9%) for dietary fiber, 17.3% (10.8%–23.4%) for dairy products, and 10.2% (6.5%-13.8%)caffeine intake, respectively. These results were consistently supported by sensitivity analysis. The association between caffeine intake and tinnitus remains contentious. Our final findings indicate a positive impact of caffeine on reducing tinnitus occurrence. Some suggest that caffeine might effectively decrease tinnitus prevalence, possibly due to its anxiety-reducing effects.

Conversely, some scholars argue that individuals with tinnitus often experience insomnia, which caffeine consumption could worsen; thus, exacerbating tinnitus symptoms. Recent observational studies 23 24 found no link between caffeine consumption and depression or anxiety levels. Furthermore, additional dose analysis revealed a J-pattern association between caffeine intake and psychiatric disorders, with around 2–3 cups per day associated with decreased risk ²⁵. Caffeine, acting as a nonselective adenosine receptor antagonist, can mitigate anxiety when ingested at a daily dose of 10 mg/kg ²⁶. Genetic analysis also suggests a correlation between caffeine consumption and reduced tinnitus prevalence ²⁷. This effect is achieved through adenosine receptor blockade, dopamine release promotion, acetylcholinesterase activity inhibition, and sympathetic nerve stimulation. In addition, our findings suggest that dietary fiber and fruit intake has a positive impact on reducing the occurrence of tinnitus, which is consistent with the results of most scientists¹¹ ¹⁴ ²¹ ²⁸. Some scholars propose that dietary fiber is associated with enhanced insulin sensitivity²⁹. Studies indicate that hyperinsulinemia from low insulin sensitivity could disturb the inner ear environment, potentially raising tinnitus risk ^{30 31}. Conversely, research suggests that fiber and dairy products might enhance blood vessel function³², a factor correlated with tinnitus. Abnormal microcirculation, for

 instance, contributes to a sustained reduction in ear blood flow, potentially leading to cochlear damage and increasing tinnitus risk ¹⁴.

Our combined analysis found no correlation between vegetable consumption and tinnitus. Identifying the source of heterogeneity was difficult due to the limited number of articles. Nevertheless, sensitivity analyses reaffirm the strength of our conclusions. Vegetables and fruits, rich in diverse vitamins and minerals crucial for maintaining health, have been shown to improve ear microcirculation, alleviate tinnitus, and offer additional benefits ^{12 28}. Future studies are expected to shed clearer results. The body has three main sources of energy: carbohydrates (sugars), fats and proteins. Our findings indicate that protein increase the occurrence of tinnitus (OR = 1.002, [95% CI 1.001-1.004], p = 0.009). Protein is a crucial nutrient requiring daily consumption and plays a vital role in supporting neuronal activity and neural development^{33 34}. Inadequate protein intake can lead to ototoxic side effects and impair the neural function of the auditory system³⁵. Dawes et al.'s study demonstrated that a higher intake of dietary pattern factor 3 (high protein) was linked to a reduced likelihood of tinnitus¹¹. Although low-protein diets may affect auditory vestibular function, no studies specify the necessary amount of protein in the diet. Our analysis found the links between protein intake and tinnitus risk. Moreover, high-protein diets have been shown to induce oxidative stress in the cerebral cortex and hypothalamus of rats³⁶. Hence,

with Meniere's disease ³⁹.

further research on the relationship between protein dosage and tinnitus is warranted in the future. In line with our analysis, no significant effect of sugar intake on tinnitus was observed (OR = 0.997 [95% CI 0.967, 1.027]). Sugars, water, and carbohydrate are essential daily components, and no links with tinnitus have been identified. High sugar consumption is typically associated with an unhealthy lifestyle. Proinflammatory foods, including sugary items, are often linked to increased not only systemic inflammation but also to microvascular damage, particularly microischemic events³⁷. Elevated blood glucose levels can harm small blood vessels and nerves in the inner ear, leading to pathological alterations in outer hair cells and spiral ganglion cells. This can result in nerve tissue ischemia and hypoxia, leading to nerve damage³⁵. Conversely, Spankovich et al. demonstrated that high carbohydrate intake can prevent hearing loss in older adults³⁸. Tang et al. showed a 45% decrease in tinnitus risk for participants in the fourth quartile compared to the first quartile of carbohydrate intake ¹⁴. Lee et al. discovered a significant correlation between reduced water intake and tinnitus-related difficulties in young and middle-aged adults¹².

Additionally, Yang et al. found that adequate water intake and a low-

sodium diet improved hearing and alleviated vertigo and tinnitus in patients

Both excessive and insufficient dietary intake may have adverse effects on tinnitus, underscoring the need for a dose–response analysis of diet, which would provide valuable insights for dietary tinnitus prevention. Several studies have suggested that increasing the score of healthy foods, such as fruits, vegetables, legumes, nuts, fish, and dairy products, may lower the risk of cardiovascular disease and mortality⁴⁰⁻⁴². With each one-fifth increase in the healthy diet score, there was a corresponding decrease in overall mortality rate (HR = 0.92; 0.90–0.93), severe cardiovascular disease (HR = 0.94; 95% CI: 0.93-0.95), myocardial infarction (HR = 0.94; 0.92-0.96), stroke (HR = 0.94; 0.89-0.99), and death or cardiovascular disease (HR = 0.93; $0.92-0.94^{43}$). The outcomes of our analysis did not support a notable connection between fat intake and tinnitus risk, although there was a discernible upward trend. Moreover, high-fat diets contribute to obesity and can lead to insulin resistance⁴⁴. Conversely, adopting a low–fat/low–cholesterol diet might aid in reducing blood cholesterol and triglyceride levels, potentially alleviating tinnitus symptoms⁴⁵. Future studies are needed to verify the relationship between the fat and tinnitus. A recent study uncovered that increased levels of dietary variety, covering quantity, evenness, and quality, were inversely linked to the risk of depressive symptoms, especially among women and older adults⁴⁶. This could potentially offer relief for tinnitus. Moreover, dietary variety is

 believed to correlate with insulin resistance⁴⁷. Given the protective effects various diets have shown on human health, further exploration of dietary variety is necessary to validate significant associations. Our pooled analysis indicated that a varied diet was not significantly linked to reduced tinnitus prevalence (OR = 0.653 [95% CI 0.410, 1.038]) based on the currently available evidence. We found only one study that investigated the impact of chocolate and flavonoids on the onset of tinnitus 19, but it did not provide sufficient data for a meta-analysis. Flavonoids, found abundantly in fruits and vegetables, offer antioxidant, anti-inflammatory, and vascular health benefits, which align with the pathophysiology of age-related hearing loss and tinnitus⁴⁸. Additionally, flavonoids interact with signaling cascades involving protein and lipid kinases, inhibiting neuronal death induced by neurotoxicants like oxygen radicals and promoting neuronal survival and synaptic plasticity⁴⁹. Despite the hypothesis that dietary flavonoids might protect against tinnitus development over a 10-year period, Tang et al. 48. did not support this idea. However, it is important to note that this study had limitations, such as insufficient data collection. Chocolate is a globally consumed product renowned for its high phenolic compound content (flavonoids being a subclass of polyphenols) 50. A study by Lee et al. indicated that chocolate consumption is not linked to tinnitus tinnitus-related issues¹⁹. An animal study demonstrated that

 polyphenols alleviate oxidative stress in the cochlea by suppressing apoptotic signaling pathways⁵¹. Nonetheless, excessive chocolate consumption can have adverse effects on brain hyperexcitability⁵². Future investigations into the association between chocolate consumption and tinnitus should take into account the intake dosage.

This systematic review and meta-analysis mark the first attempt to explore the epidemiological link between diet and tinnitus. While we examined the relationships between fruit, dietary fiber, and caffeine intake and a reduced

prevalence of tinnitus, it remains inconclusive whether a causal

Conclusion

relationship exists.

Diet-based strategies for tinnitus prevention are anticipated to play a significant role in chronic tinnitus management. Existing evidence suggests that consuming fruit, dietary fiber, caffeine, and dairy may be associated with a reduced prevalence of tinnitus. The primary underlying mechanisms may involve the protective effects of these diets on blood vessels and nerves, as well as their anti-inflammatory and antioxidant properties. However, it is crucial to interpret our findings cautiously due to the overall low quality of the evidence available. In the future, further well-designed, large-scale, cross-population cohort studies are warranted to complement and verify the relationship between dietary intake and tinnitus.

418	Additionally, focusing on the dosage and categorization of each dietary
419	intake would provide valuable insights.
420	

Author Contribution

- All authors contributed to the study's conception and design. SZ, MZ, XW,
- 423 YJ conducted data collection and analysis. SZ, QZ designed the test plan.
- QF as the paper guide, control the quality of the paper, XH, XL, XW, HW
- drew the chart. XC, LW, LF completed the writing of the test plan. XL and
- QZ revised the manuscript. QZ is responsible for the overall content as the
- 427 guarantor.

Author Declaration

The author has no direct conflict of interest.

Ethical Approval

- The article belongs to the review category and does not require the
- approval of the ethics committee.

Funding

- This work was supported by the National Natural Science Foundation of
- China (No. 81774131, 82174198), 'Xinglin Scholars Scientific Research
- Promotion Plan of Chengdu University of Traditional Chinese Medicine

 Innovation team of traditional Chinese medicine otorhinolaryngology discipline, natural science (No. XKTD2021003).

Data availability statement

The data used to support the findings of this study are available from the corresponding author upon request.

Reference

- 1. Mazurek B, Hesse G, Sattel H, et al. S3 Guideline: Chronic Tinnitus: German Society for
- Otorhinolaryngology, Head and Neck Surgery e. V. (DGHNO-KHC). *Hno* 2022;70(11):795-827.
- 450 doi: 10.1007/s00106-022-01207-4 [published Online First: 2022/10/14]
- 2. McCormack A, Edmondson-Jones M, Mellor D, et al. Association of dietary factors with
- 452 presence and severity of tinnitus in a middle-aged UK population. PLoS One
- 453 2014;9(12):e114711. doi: 10.1371/journal.pone.0114711 [published Online First: 2014/12/17]
- 454 3. MacDonald C, Caimino C, Burns-O'Connell G, et al. Tinnitus, Suicide, and Suicidal Ideation:
- 455 A Scoping Review of Primary Research. Brain Sci 2023;13(10) doi: 10.3390/brainsci13101496
- 456 [published Online First: 2023/10/28]
- 457 4. Jarach CM, Lugo A, Scala M, et al. Global Prevalence and Incidence of Tinnitus: A
- 458 Systematic Review and Meta-analysis. *JAMA Neurol* 2022;79(9):888-900. doi:
- 459 10.1001/jamaneurol.2022.2189 [published Online First: 2022/08/09]
- 5. Zhou F, Zhang T, Jin Y, et al. Worldwide Tinnitus Research: A Bibliometric Analysis of the
- 461 Published Literature Between 2001 and 2020. Front Neurol 2022;13:828299. doi:

- 462 10.3389/fneur.2022.828299 [published Online First: 2022/02/18]
- 463 6. Langguth B, Kreuzer PM, Kleinjung T, et al. Tinnitus: causes and clinical management.
- 464 Lancet Neurol 2013;12(9):920-30. doi: 10.1016/s1474-4422(13)70160-1 [published Online
- 465 First: 2013/08/21]

- 466 7. Kleinjung T, Peter N, Schecklmann M, et al. The Current State of Tinnitus Diagnosis and
- 467 Treatment: a Multidisciplinary Expert Perspective. J Assoc Res Otolaryngol 2024;25(5):413-25.
- 468 doi: 10.1007/s10162-024-00960-3 [published Online First: 2024/08/14]
- 8. Park KW, Kullar P, Malhotra C, et al. Current and Emerging Therapies for Chronic Subjective
- 470 Tinnitus. *J Clin Med* 2023;12(20) doi: 10.3390/jcm12206555 [published Online First:
- 471 2023/10/28]
- 9. Sereda M, Xia J, El Refaie A, et al. Sound therapy (using amplification devices and/or sound
- 473 generators) for tinnitus. *Cochrane Database Syst Rev* 2018;12(12):Cd013094. doi:
- 474 10.1002/14651858.CD013094.pub2 [published Online First: 2018/12/28]
- 10. Lewis S, Chowdhury E, Stockdale D, et al. Assessment and management of tinnitus:
- 476 summary of NICE guidance. *Bmj* 2020;368:m976. doi: 10.1136/bmj.m976 [published Online
- 477 First: 2020/04/03]
- 478 11. Dawes P, Cruickshanks KJ, Marsden A, et al. Relationship Between Diet, Tinnitus, and
- 479 Hearing Difficulties. *Ear Hear* 2020;41(2):289-99. doi: 10.1097/aud.00000000000000765
- 480 [published Online First: 2019/07/30]
- 481 12. Lee DY, Kim YH. Relationship Between Diet and Tinnitus: Korea National Health and
- 482 Nutrition Examination Survey. Clin Exp Otorhinolaryngol 2018;11(3):158-65. doi
- 483 10.21053/ceo.2017.01221 [published Online First: 2018/02/13]

- 13. Marcrum SC, Engelke M, Goedhart H, et al. The Influence of Diet on Tinnitus Severity:
- 485 Results of a Large-Scale, Online Survey. *Nutrients* 2022;14(24) doi: 10.3390/nu14245356
- 486 [published Online First: 2022/12/24]
- 487 14. Tang D, Tran Y, Shekhawat GS, et al. Dietary Fibre Intake and the 10-Year Incidence of
- Tinnitus in Older Adults. Nutrients 2021;13(11) doi: 10.3390/nu13114126 [published Online
- 489 First: 2021/11/28]
- 490 15. Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated
- 491 guideline for reporting systematic reviews. *Bmj* 2021;372:n71. doi: 10.1136/bmj.n71 [published
- 492 Online First: 2021/03/31]
- 493 16. Stroup DF, Berlin JA, Morton SC, et al. Meta-analysis of observational studies in
- 494 epidemiology: a proposal for reporting. Meta-analysis Of Observational Studies in
- 495 Epidemiology (MOOSE) group. *Jama* 2000;283(15):2008-12. doi: 10.1001/jama.283.15.2008
- 496 [published Online First: 2000/05/02]
- 497 17. Jarach CM, Lugo A, Garavello W, et al. The Role of Diet in Tinnitus Onset: A Hospital-
- 498 Based Case-Control Study from Italy. *Nutrients* 2023;15(3) doi: 10.3390/nu15030621
- 499 [published Online First: 2023/02/12]
- 18. Tang D, Tran Y, Lewis JR, et al. Associations between intake of dietary flavonoids and the
- 501 10-year incidence of tinnitus in older adults. $Eur\ J\ Nutr\ 2022;61(4):1957-64.$ doi:
- 502 10.1007/s00394-021-02784-w [published Online First: 2022/01/25]
- 503 19. Lee SY, Jung G, Jang MJ, et al. Association of Chocolate Consumption with Hearing Loss
- and Tinnitus in Middle-Aged People Based on the Korean National Health and Nutrition
- 505 Examination Survey 2012⁻2013. *Nutrients* 2019;11(4) doi: 10.3390/nu11040746 [published

506	Online First: 2019/04/03]
507	20. Lee SY, Jung G, Jang MJ, et al. Association of Coffee Consumption with Hearing and
508	Tinnitus Based on a National Population-Based Survey. <i>Nutrients</i> 2018;10(10) doi:
509	10.3390/nu10101429 [published Online First: 2018/10/06]
510	21. Spankovich C, Bishop C, Johnson MF, et al. Relationship between dietary quality, tinnitus
511	and hearing level: data from the national health and nutrition examination survey, 1999-2002.
512	Int J Audiol 2017;56(10):716-22. doi: 10.1080/14992027.2017.1331049 [published Online First:
513	2017/05/30]
514	22. Glicksman JT, Curhan SG, Curhan GC. A prospective study of caffeine intake and risk of
515	incident tinnitus. <i>Am J Med</i> 2014;127(8):739-43. doi: 10.1016/j.amjmed.2014.02.033 [published
516	Online First: 2014/03/13]
517	23. Castro A, Gili M, Visser M, et al. Soft Drinks and Symptoms of Depression and Anxiety in
518	Overweight Subjects: A Longitudinal Analysis of an European Cohort. <i>Nutrients</i> 2023;15(18)
519	doi: 10.3390/nu15183865 [published Online First: 2023/09/28]
520	24. Makki NM, Alharbi ST, Alharbi AM, et al. Caffeine Consumption and Depression, Anxiety,
521	and Stress Levels Among University Students in Medina: A Cross-Sectional Study. Cureus
522	2023;15(10):e48018. doi: 10.7759/cureus.48018 [published Online First: 2023/11/02]
523	25. Min J, Cao Z, Cui L, et al. The association between coffee consumption and risk of incident
524	depression and anxiety: Exploring the benefits of moderate intake. Psychiatry Res
525	2023;326:115307. doi: 10.1016/j.psychres.2023.115307 [published Online First: 2023/06/23]
526	26. Imam-Fulani A, Owoyele BV. Effect Of Caffeine and Adrenaline on Memory and Anxiety in
527	Male Wistar Rats. <i>Niger J Physiol Sci</i> 2022;37(1):69-76. doi: 10.54548/njps.v37i1.9 [published

- 528 Online First: 2022/08/11]
- 529 27. Cresswell M, Casanova F, Beaumont RN, et al. Understanding Factors That Cause Tinnitus:
- 530 A Mendelian Randomization Study in the UK Biobank. Ear Hear 2022;43(1):70-80. doi:
- 531 10.1097/aud.000000000001074 [published Online First: 2021/06/11]
- 532 28. Tomanic M, Belojevic G, Jovanovic A, et al. Dietary Factors and Tinnitus among
- Adolescents. Nutrients 2020;12(11) doi: 10.3390/nu12113291 [published Online First:
- 534 2020/10/31]
- 29. Barber TM, Kabisch S, Pfeiffer AFH, et al. The Health Benefits of Dietary Fibre. *Nutrients*
- 536 2020;12(10) doi: 10.3390/nu12103209 [published Online First: 2020/10/25]
- 30. Mangabeira Albernaz PL, Fukuda Y. Glucose, insulin and inner ear pathology. Acta
- *Otolaryngol* 1984;97(5-6):496-501. doi: 10.3109/00016488409132927 [published Online First:
- 539 1984/05/01]
- 31. Borghi C, Cosentino ER, Rinaldi ER, et al. Tinnitus in elderly patients and prognosis of mild-
- to-moderate congestive heart failure: a cross-sectional study with a long-term extension of the
- 542 clinical follow-up. *BMC Med* 2011;9:80. doi: 10.1186/1741-7015-9-80 [published Online First:
- 543 2011/06/30]
- 32. Jeong Y, Lee KW, Kim H, et al. Association of milk and dairy product consumption with the
- incidence of cardio-cerebrovascular disease incidence in middle-aged and older Korean adults:
- 546 a 16-year follow-up of the Korean Genome and Epidemiology Study. Nutr Res Pract
- 547 2023;17(6):1225-37. doi: 10.4162/nrp.2023.17.6.1225 [published Online First: 2023/12/06]
- 33. Cui F, Li H, Cao Y, et al. The Association between Dietary Protein Intake and Sources and
- 549 the Rate of Longitudinal Changes in Brain Structure. Nutrients 2024;16(9) doi:

550 10.3390/nu16091284 [published Online First: 2024/05/11]

- 34. Abey NO, Ebuehi OAT, Imaga NOA. Neurodevelopment and Cognitive Impairment in
- 552 Parents and Progeny of Perinatal Dietary Protein Deficiency Models. Front Neurosci
- 553 2019;13:826. doi: 10.3389/fnins.2019.00826 [published Online First: 2019/09/26]
- 35. Chen HL, Tan CT, Wu CC, et al. Effects of Diet and Lifestyle on Audio-Vestibular
- 555 Dysfunction in the Elderly: A Literature Review. Nutrients 2022;14(22) doi:
- 556 10.3390/nu14224720 [published Online First: 2022/11/27]
- 36. Żebrowska E, Maciejczyk M, Żendzian-Piotrowska M, et al. High Protein Diet Induces
- Oxidative Stress in Rat Cerebral Cortex and Hypothalamus. *Int J Mol Sci* 2019;20(7) doi:
- 559 10.3390/ijms20071547 [published Online First: 2019/03/31]
- 37. Sardone R, Lampignano L, Guerra V, et al. Relationship between Inflammatory Food
- Consumption and Age-Related Hearing Loss in a Prospective Observational Cohort: Results
- from the Salus in Apulia Study. Nutrients 2020;12(2) doi: 10.3390/nu12020426 [published
- 563 Online First: 2020/02/13]
- 38. Spankovich C, Hood LJ, Silver HJ, et al. Associations between diet and both high and low
- 565 pure tone averages and transient evoked otoacoustic emissions in an older adult population-
- 566 based study. J Am Acad Audiol 2011;22(1):49-58. doi: 10.3766/jaaa.22.1.6 [published Online
- 567 First: 2011/03/23]
- 39. Yang X, Lin C, Wu Q, et al. Low-sodium diet with adequate water intake improved the
- 569 clinical efficacy in Ménière's disease. Acta Otolaryngol 2024;144(1):14-18. doi:
- 570 10.1080/00016489.2024.2315302 [published Online First: 2024/02/20]
- 571 40. Ocagli H, Berti G, Rango D, et al. Association of Vegetarian and Vegan Diets with

- 572 Cardiovascular Health: An Umbrella Review of Meta-Analysis of Observational Studies and
- Randomized Trials. *Nutrients* 2023;15(19) doi: 10.3390/nu15194103 [published Online First:
- 574 2023/10/14]
- 575 41. Tan L, Stagg L, Hanlon E, et al. Associations between Vegetable Nitrate Intake and
- 576 Cardiovascular Disease Risk and Mortality: A Systematic Review. *Nutrients* 2024;16(10) doi:
- 577 10.3390/nu16101511 [published Online First: 2024/05/25]
- 578 42. Doundoulakis I, Farmakis IT, Theodoridis X, et al. Effects of dietary interventions on
- 579 cardiovascular outcomes: a network meta-analysis. *Nutr Rev* 2024;82(6):715-25. doi:
- 580 10.1093/nutrit/nuad080 [published Online First: 2023/07/11]
- 43. Mente A, Dehghan M, Rangarajan S, et al. Diet, cardiovascular disease, and mortality in
- 582 80 countries. Eur Heart J 2023;44(28):2560-79. doi: 10.1093/eurheartj/ehad269 [published
- 583 Online First: 2023/07/07]
- 584 44. Tsai SF, Wu HT, Chen PC, et al. High-fat diet suppresses the astrocytic process
- arborization and downregulates the glial glutamate transporters in the hippocampus of mice.
- 586 Brain Res 2018;1700:66-77. doi: 10.1016/j.brainres.2018.07.017 [published Online First:
- 587 2018/07/17]
- 45. Musleh A, Alshehri S, Qobty A. Hyperlipidemia and its relation with tinnitus: Cross-sectional
- 589 approach. *Niger J Clin Pract* 2022;25(7):1046-49. doi: 10.4103/njcp.njcp_1465_21 [published
- 590 Online First: 2022/07/22]
- 591 46. Li Z, Li PW, Zhang D. Association between all aspects of dietary diversity and risk of
- 592 depressive symptoms in US adults. Food Funct 2023;14(20):9204-11. doi
- 593 10.1039/d3fo00642e [published Online First: 2023/10/04]

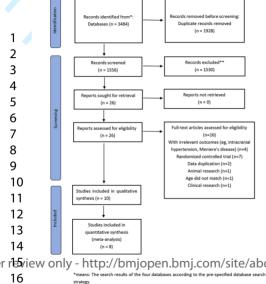
594	47. Mozaffari H, Hosseini Z, Lafrenière J, et al. The role of dietary diversity in preventing
595	metabolic-related outcomes: Findings from a systematic review. <i>Obes Rev</i> 2021;22(6):e13174.
596	doi: 10.1111/obr.13174 [published Online First: 2021/02/23]
597	48. Tang D, Tran Y, Shekhawat GS, et al. Dietary Flavonoid Intake and Chronic Sensory
598	Conditions: A Scoping Review. Antioxidants (Basel) 2022;11(7) doi: 10.3390/antiox11071214
599	[published Online First: 2022/07/28]
600	49. Nehlig A. The neuroprotective effects of cocoa flavanol and its influence on cognitive
601	performance. Br J Clin Pharmacol 2013;75(3):716-27. doi: 10.1111/j.1365-2125.2012.04378.x
602	[published Online First: 2012/07/11]
603	50. da Silva Medeiros N, Koslowsky Marder R, Farias Wohlenberg M, et al. Total Phenolic
604	Content and Antioxidant Activity of Different Types of Chocolate, Milk, Semisweet, Dark, and
605	Soy, in Cerebral Cortex, Hippocampus, and Cerebellum of Wistar Rats. Biochem Res Int
606	2015;2015:294659. doi: 10.1155/2015/294659 [published Online First: 2015/12/10]
607	51. Sánchez-Rodríguez C, Cuadrado E, Riestra-Ayora J, et al. Polyphenols protect against
608	age-associated apoptosis in female rat cochleae. <i>Biogerontology</i> 2018;19(2):159-69. doi:
609	10.1007/s10522-018-9747-7 [published Online First: 2018/01/25]
610	52. Cicvaric A, Bulat T, Bormann D, et al. Sustained consumption of cocoa-based dark
611	chocolate enhances seizure-like events in the mouse hippocampus. Food Function
612	2018;9(3):1532-44. doi: 10.1039/c7fo01668a [published Online First: 2018/02/13]
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Figure 1: Flow chart

Figure 2: Risk ratio summary of diet and tinnitus prevalence



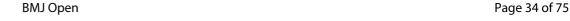


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17	Carbohydrate	2	33.0%	1.001	1.000	1.002						Ţ		en rig		Low	NS
18	Caffeine	3	23.0%	0.898	0.862	0.935					-			-20 ht,		Low	Class II
19	Varied diet	2	50.0%	0.653	0.410	1.038		-				+		en-2024-091507 right, including		Very low	NS
20	Egg	2	55.0%	1.010	0.880	1.160						•		<u>ii</u> 69		Very low	NS
21	Fruit	3	0.0%	0.649	0.532	0.793								15(din		Moderate	Class II
22	Fiber	3	63.0%	0.918	0.851	0.990					-8	_		9 f		Low	Class II
23	Fat	3	73.0%	1.072	0.973	1.181						+		for		Very low	NS
24	Margarine	2	0.0%	1.208	0.900	1.622						_		[8		Low	NS
25	Meat	2	0.0%	1.099	0.783	1.542				_				¥ ≤		Low	NS
26	Protein	2	0.0%	1.002	1.001	1.004						•		<u>е</u> п <u>с</u>		Low	Class III
27	Sugar	3	0.0%	0.997	0.967	1.027						#		າ 20 ras itec		Low	NS
28	Fish	3	72.0%	0.979	0.907	1.056					_	-		t 25		Very low	NS
29	Vegetable	4	0.0%	1.101	0.907	1.337					_		_	ish te		Very low	NS
30	Water	3	0.0%	1.003	0.992	1.014						•		ž o o		Low	NS
31	Dairy	2	0.0%	0.827	0.766	0.892					-			18 March 2025. Downlo Erasmushogesc uses related to text and		Low	Class II
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The blue or red dots represent OR values, and the black linesrepresent confidence intervals The blue or red dots represent OR values, and the black linesrepresent confidence intervals

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36p<0.05 indicates statistical difference.

37The evidence classification criteria: Class I (convincing evidence), Class II (highly suggestive evidence), Class III (suggestive evidence), Class IV

³⁸(weak evidence), and NS (non-significant). training, and similar technologies.

³⁹₄₀GRADE:Grade of Recommendations Assessment, Development, and Evaluation.

41 Moderate: The results of current efficacy evaluation are likely to be close to the true value;

42Low: The reliability of the current efficacy evaluation results is uncertain;

⁴³Very low: The reliability of the current efficacy evaluation results is very uncertain;

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eFigure 24:Publication bias and Egger test on vegetable.	righ -Z	29
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We used mixed-effects models to pool maximally covariate-adjusted odds ratios (ORs) from each study. Due to the low incidence of events and short follow-up events, OR, RR, and inter-study heterogeneity to be significant. For observational studies, we maximally support covariate-adjusted estimates. If a tues uses an analytical method that is incompatible with synthesis for most other studies, we convert the effect estimate to the appropriate combined ratio or exclude the study from the recta-analysis.

Stata analysis

Publication bias

If the article heterogeneity is large in the analysis with statistical differences, we will use meta regression to investigate the source of the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with the funne

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Diana Tang 2021b	-0.3024573	0.2282614	0.0%	0.74 [0.47, 1.16]	•				
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Doh Young Lee 2018	0.0009995	0.0005102	100.0%	1.00 [1.00, 1.00]			es	2025	
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Piers Dawes 2020d	-0.0725707	0.0876968	0.0%	0.93 [0.78, 1.10]	•			Department	
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Test for overall effect: Z		373 3			0.85 Favo	urs [experimental] Favo	urs [control]	GEZ-LTA	

Study	ES	[95% Conf. I	nterval]	% Weight
Diana Tang 2021a	0.740	0.469	1.168	0.00
Diana Tang 2021b	0.739	0.472	1.156	0.00
Diana Tang 2021c	0.550	0.338	0.895	0.00
Doh Young Lee 2018	1.001	1.000	1.002	99.97
Piers Dawes 2020a	1.030	0.935	1.134	0.01
Piers Dawes 2020b	0.980	0.873	1.101	0.01
Piers Dawes 2020c	0.990	0.860	1.140	0.01
Piers Dawes 2020d	0.930	0.783	1.104	0.00
T-V pooled FS	1.001	1.000	1.002	100.00

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 Carlotta Micaela Jar	0.490	0.241	0.995	0.33
Carlotta Micaela Jar	0.690	0.336	1.415	0.32
Jordan T 2014a	0.940	0.882	1.002	40.76
Jordan T 2014b	0.910	0.842	0.983	28.03
Jordan T 2014c	0.850	0.760	0.950	13.38
Jordan T 2014d	0.790	0.683	0.914	7.85
Sang-Youp Lee 2018	0.800	0.635	1.008	3.12
Sang-Youp Lee 2018	0.900	0.733	1.105	3.96
Sang-Youp Lee 2018	0.950	0.724	1.247	2.25
I-V pooled ES	0.898	0.862	0.935	100.00

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Carlotta Micaela Jar	0.690	0.336	1.415	0.32	
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Sang-Youp Lee 2018	0.900	0.733	1.105	3.96	
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Black diamonds are the esti	mated poole	ed odd ratio (O	R) for each ra	ndom-effects meta-a	nalysis; Red box sizes reflect the relative weight apportioned to studies in the meta- and
Black diamonds are the esti	mated poole CI 0.41,1.04	ed odd ratio (O	R) for each ra		nalysis; Red box sizes reflect the relative weight apportioned to studies in the meta- and one of the control o
Black diamonds are the esti Diversity: OR=0.65, [95%C	mated poole CI 0.41,1.04	ed odd ratio (Ol], I ² =50% p=0.0	R) for each ra 08.	ndom-effects meta-a	nalysis; Red box sizes reflect the relative weight apportioned to studies in the meta- and one of the control o
Black diamonds are the esti Diversity: OR=0.65, [95%C	mated poole CI 0.41,1.04 log[0 23a	ed odd ratio (Ol], I ² =50% p=0.0	R) for each ra 08. SE We 3247361 29	ndom-effects meta-a Odds Ratio ight IV, Random, 95	Odds Ratio and box sizes reflect the relative we have a portioned to studies in the meta- and the studies in the studies in the meta- and the studies in the
Black diamonds are the esti Diversity: OR=0.65, [95%C Study or Subgroup Carlotta Micaela Jarach 20 Carlotta Micaela Jarach 20	mated poole CI 0.41,1.04 log[0 23a 23b	ed odd ratio (Ol], I ² =50% p=0.0 Odds Ratio] -0.6348783 0.	R) for each ra 08. SE We 3247361 29 3371826 28	ndom-effects meta-a Odds Ratio ight IV, Random, 95 0.53 [0.28,	Odds Ratio N, Random, 95% (1) Odds Ratio Odds Rat
Black diamonds are the esti Diversity: OR=0.65, [95%C Study or Subgroup Carlotta Micaela Jarach 20	mated poole CI 0.41,1.04 log[0 23a 23b	ed odd ratio (Ol], I ² =50% p=0.0 Odds Ratio] -0.6348783 0. -0.7550226 0.	R) for each ra 08. SE We 3247361 29 3371826 28 0.2295 41	Odds Ratio ight IV, Random, 95 0.7% 0.47 [0.24, 0.48] 0.96 [0.61, 1	Odds Ratio N, Random, 95% (1) Odds Ratio Odds Rat
Black diamonds are the esti Diversity: OR=0.65, [95%C Study or Subgroup Carlotta Micaela Jarach 20 Carlotta Micaela Jarach 20	mated poole CI 0.41,1.04 log[0 23a 23b	ed odd ratio (Ol], I ² =50% p=0.0 Odds Ratio] -0.6348783 0. -0.7550226 0.	R) for each ra 08. SE We 3247361 29 3371826 28 0.2295 41	Odds Ratio ight IV, Random, 95 0.9% 0.53 [0.28, 1 0.47 [0.24, 1	Odds Ratio N, Random, 95% on May Odds Ratio
Black diamonds are the esti Diversity: OR=0.65, [95%C Study or Subgroup Carlotta Micaela Jarach 20 Carlotta Micaela Jarach 20 Christopher Spankovich 20	mated poole CI 0.41,1.04 logi(0 23a 23b 017	ed odd ratio (Ol], I ² =50% p=0.0 Odds Ratio] -0.6348783 0.1 -0.7550226 0.1 -0.0444	R) for each ra 08. SE We 3247361 29 3371826 28 0.2295 41	Odds Ratio ight IV, Random, 95 0.53 [0.28, 0.47] 0.7% 0.47 [0.24, 0.48] 0.96 [0.61, 0.96]	nalysis; Red box sizes reflect the relative weight apportioned to studies in the meta- and odds Ratio odds Rat
Black diamonds are the esti Diversity: OR=0.65, [95%C Study or Subgroup Carlotta Micaela Jarach 20 Carlotta Micaela Jarach 20 Christopher Spankovich 20 Total (95% CI)	mated poole CI 0.41,1.04 log[0 23a 23b 017	ed odd ratio (Ol], I ² =50% p=0.0 Odds Ratio] -0.6348783 0.1 -0.7550226 0.1 -0.0444 , df= 2 (P = 0.14	R) for each ra 08. SE We 3247361 29 3371826 28 0.2295 41	Odds Ratio ight IV, Random, 95 0.53 [0.28, 0.47] 0.7% 0.47 [0.24, 0.48] 0.96 [0.61, 0.96]	nalysis; Red box sizes reflect the relative weight apportioned to studies in the meta- and odds Ratio odds Rat
Black diamonds are the esti Diversity: OR=0.65, [95%C Study or Subgroup Carlotta Micaela Jarach 20 Carlotta Micaela Jarach 20 Christopher Spankovich 20 Total (95% CI) Heterogeneity: Tau ² = 0.09	mated poole CI 0.41,1.04 log[0 23a 23b 017	ed odd ratio (Ol], I ² =50% p=0.0 Odds Ratio] -0.6348783 0.1 -0.7550226 0.1 -0.0444 , df= 2 (P = 0.14	R) for each ra 08. SE We 3247361 29 3371826 28 0.2295 41	Odds Ratio ight IV, Random, 95 0.7% 0.47 [0.24, 0.48] 0.96 [0.61, 1	Odds Ratio
Black diamonds are the esti Diversity: OR=0.65, [95%C Study or Subgroup Carlotta Micaela Jarach 20 Carlotta Micaela Jarach 20 Christopher Spankovich 20 Total (95% CI) Heterogeneity: Tau ² = 0.09	mated poole CI 0.41,1.04 log[0 23a 23b 017	ed odd ratio (Ol], I ² =50% p=0.0 Odds Ratio] -0.6348783 0.1 -0.7550226 0.1 -0.0444 , df= 2 (P = 0.14	R) for each ra 08. SE We 3247361 29 3371826 28 0.2295 41	Odds Ratio ight IV, Random, 95 0.7% 0.47 [0.24, 0.48] 0.96 [0.61, 1	Odds Ratio
Black diamonds are the esti Diversity: OR=0.65, [95%C Study or Subgroup Carlotta Micaela Jarach 20 Carlotta Micaela Jarach 20 Christopher Spankovich 20 Total (95% CI) Heterogeneity: Tau ² = 0.09	mated poole CI 0.41,1.04 log[0 23a 23b 017	ed odd ratio (Ol], I ² =50% p=0.0 Odds Ratio] -0.6348783 0.1 -0.7550226 0.1 -0.0444 , df= 2 (P = 0.14	R) for each ra 08. SE We 3247361 29 3371826 28 0.2295 41	Odds Ratio ight IV, Random, 95 0.7% 0.47 [0.24, 0.48] 0.96 [0.61, 1	Odds Ratio
Black diamonds are the esti Diversity: OR=0.65, [95%C Study or Subgroup Carlotta Micaela Jarach 20 Carlotta Micaela Jarach 20 Christopher Spankovich 20 Total (95% CI) Heterogeneity: Tau ² = 0.09	mated poole CI 0.41,1.04 log[0 23a 23b 017	ed odd ratio (Ol], I ² =50% p=0.0 Odds Ratio] -0.6348783 0.1 -0.7550226 0.1 -0.0444 , df= 2 (P = 0.14	R) for each ra 08. SE We 3247361 29 3371826 28 0.2295 41	Odds Ratio ight IV, Random, 95 0.7% 0.47 [0.24, 0.48] 0.96 [0.61, 1	Odds Ratio
Black diamonds are the esti Diversity: OR=0.65, [95%C Study or Subgroup Carlotta Micaela Jarach 20 Carlotta Micaela Jarach 20 Christopher Spankovich 20 Total (95% CI) Heterogeneity: Tau ² = 0.09	mated poole CI 0.41,1.04 log[0 23a 23b 017	ed odd ratio (Ol], I ² =50% p=0.0 Odds Ratio] -0.6348783 0.1 -0.7550226 0.1 -0.0444 , df= 2 (P = 0.14	R) for each ra 08. SE We 3247361 29 3371826 28 0.2295 41	Odds Ratio ight IV, Random, 95 0.7% 0.47 [0.24, 0.48] 0.96 [0.61, 1	Odds Ratio
Black diamonds are the esti Diversity: OR=0.65, [95%C Study or Subgroup Carlotta Micaela Jarach 20 Carlotta Micaela Jarach 20 Christopher Spankovich 20 Total (95% CI) Heterogeneity: Tau ² = 0.09	mated poole CI 0.41,1.04 log[0 23a 23b 017	ed odd ratio (Ol], I ² =50% p=0.0 Odds Ratio] -0.6348783 0.1 -0.7550226 0.1 -0.0444 , df= 2 (P = 0.14	R) for each ra 08. SE We 3247361 29 3371826 28 0.2295 41	Odds Ratio ight IV, Random, 95 0.7% 0.47 [0.24, 0.48] 0.96 [0.61, 1	Odds Ratio
Black diamonds are the esti Diversity: OR=0.65, [95%C Study or Subgroup Carlotta Micaela Jarach 20 Carlotta Micaela Jarach 20 Christopher Spankovich 20 Total (95% CI) Heterogeneity: Tau ² = 0.09	mated poole CI 0.41,1.04 log[0 23a 23b 017	ed odd ratio (Ol], I ² =50% p=0.0 Odds Ratio] -0.6348783 0.1 -0.7550226 0.1 -0.0444 , df= 2 (P = 0.14	R) for each ra 08. SE We 3247361 29 3371826 28 0.2295 41	Odds Ratio ight IV, Random, 95 0.7% 0.47 [0.24, 0.48] 0.96 [0.61, 1	Odds Ratio
Black diamonds are the esti Diversity: OR=0.65, [95%C Study or Subgroup Carlotta Micaela Jarach 20 Carlotta Micaela Jarach 20 Christopher Spankovich 20 Total (95% CI) Heterogeneity: Tau ² = 0.09	mated poole CI 0.41,1.04 log[0 23a 23b 017	ed odd ratio (Ol], I ² =50% p=0.0 Odds Ratio] -0.6348783 0.1 -0.7550226 0.1 -0.0444 , df= 2 (P = 0.14	R) for each ra 08. SE We 3247361 29 3371826 28 0.2295 41	Odds Ratio ight IV, Random, 95 0.7% 0.47 [0.24, 0.48] 0.96 [0.61, 1	nalysis; Red box sizes reflect the relative weight apportioned to studies in the meta- and odds Ratio odds Rat

Study	ES	[95% Conf.	Interval]	% Weight
+ Carlotta Micaela Jar	0.530	0.280	1.002	29.86
Carlotta Micaela Jar	0.470	0.243	0.910	28.60
Christopher Spankovi	0.950	0.606	1.490	41.54
D+L pooled ES	0.653	0.410	1.038	100.00

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Study	ES	[95% Co	onf.	Interval]	% Weight)24-091507
Carlotta Micaela Ja	r 0.530	0.28	80	1.002	29.86	for on
Carlotta Micaela Ja	r 0.470	0.24	13	0.910	28.60	u 18
Christopher Spankov	i 0.950	0.60	96	1.490	41.54	Marc Feb
D+L pooled ES	0.653	0.41	10	1.038	100.00	18 March 2025. Downloaded Erasmushogeschool uses related to text and data
Actually: diversity: OR=0.653,	[95%CI 0.410, 1.03	8].				. Dow
5						and
6						hade da
⁷ eFigure 4: Forest Plot	Showing the	Association	n Ret	ween eoo and t	innitus	ta · · · · · · · · · · · · · · · · · · ·
8	Showing the 1	1550014110	пъсс	ween egg and t	iiiiitus.	ni n
9 Rlack diamonds are the estimate	ed pooled odd ratio	(OR) for each	randon	n-effects meta-analys	sis: Red boy size	s reflect the relative weight apportioned to studies in the meta-analysis
Black diamonds are the estimate Egg: OR=1.02, [95%CI 0.91,1.			ranuon	ii-criccis ilicia-aliarys	sis, Red box size:	
22	- J ,			Odds Ratio		Odds Ratio train p IV, Random, 95% 51 9
Study or Subgroup	log[Odds Ratio]	SE I	Weight	IV, Random, 95% CI		Odds Ratio (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)
4 Abby McCormack 2014a	0.0304592		43.4%	1.03 [0.98, 1.09]		<u> </u>
5 Abby McCormack 2014b			32.9%			and bm
6 Abby McCormack 2014c			17.3%	0.90 [0.72, 1.13]		j.com/ o
7 Carlotta Micaela Jarach 2023a		0.338181	3.0%	0.99 [0.51, 1.92]		ii ž
8 Carlotta Micaela Jarach 2023b	-0.6161861	0.3157843	3.4%	0.54 [0.29, 1.00]		
9 O Total (95% CI)		9	100.0%	1.02 [0.91, 1.15]		on May- techno
Heterogeneity: Tau ^z = 0.01; Ch	i²= 8 83 df= 4 (P=)			1.02 [0.5 1, 1.15]	F +	
riciciogeneity, rau = 0.01, Ci	10 - 0.03, $ur - 4 (r - 1)$	3.077, 1 - 33.70			0.01 0.1	1 © . 90 100
Test for overall effect: $7 = 0.32$	(P = 0.75)					
	(P = 0.75)				Favours [exp	
	(P = 0.75)				Favours [exp	perimental] Favour (can captrol)
} }	(P = 0.75)				Favours [exp	perimental] Favour (can captrol)
} 	(P = 0.75)				Favours [exp	perimental] Favour (can captrol)
3 4 5	(P = 0.75)				Favours [exp	perimental] Favour (can captrol)
Test for overall effect: Z = 0.32 Test for overall effect: Z = 0.32 Test for overall effect: Z = 0.32	(P = 0.75)				Favours [exp	perimental] Favour (can captrol)
	(P = 0.75)				Favours [exp	perimental] Favour (can captrol)
	(P = 0.75)				Favours [exp	perimental] Favour (can captrol)
	(P = 0.75)				Favours [exp	

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. metan logrr selogrr,	label(na	mevar=author)	random efo	rm			
Study	ES	[95% Conf.	Interval]	% Weight		-2024-091507 ht, including	
Abby McCormack 2014	1.031	0.926	1.148	36.13		507 on	
Abby McCormack 2014a	1.149	1.024	1.290	35.00			
Abby McCormack 2014b	0.901	0.717	1.133	20.41		18 March Er. uses relat	
Carlotta Micaela Jar	0.990	0.510	1.921	3.97		rch Era	
Carlotta Micaela Jar	0.540	0.291	1.003	4.50		arch 2025. Erasmus	
D+L pooled ES	1.010	0.880	1.160	100.00		Downlo: shogesch	
Actually: diversity: OR=1.010, [95	%CI 0.880, 1.1	60].	607			Downloaded from hogeschool .	
eFigure 5: Forest Plot Sh	owing the	Association Be	tween fruit a	nd tinnitus.	ę	ո http://br	
Black diamonds are the estimated pruit: OR=0.65, [95%CI 0.53,0.79]	oooled odd ration, I ² =0% p<0.00	o (OR) for each rando	om-effects meta-ar	alysis; Red box sizes	•	<u> </u>	es in the meta-a
			Odds Ratio		Odds Ratio	in br	

Study or Subgroup	log[Odds Ratio]	SE	Weight	Odds Ratio IV, Fixed, 95% CI	Odds Ratio and billion of the control of the contro
Carlotta Micaela Jarach 2023a	-0.040822	0.3655756	7.7%	0.96 [0.47, 1.97]	nila vij
Carlotta Micaela Jarach 2023b	-0.2484614	0.3083197	10.9%	0.78 [0.43, 1.43]	ar e
Christopher Spankovich 2017	-0.4942963	0.2033897	25.0%	0.61 [0.41, 0.91]	n Ma
Diana Tang 2021a	-0.7550226	0.2457749	17.1%	0.47 [0.29, 0.76]	ay nnc
Diana Tang 2021b	-0.3856625	0.230163	19.5%	0.68 [0.43, 1.07]	
Diana Tang 2021c	-0.3710637	0.2290667	19.7%	0.69 [0.44, 1.08]	
Total (95% CI)			100.0%	0.65 [0.53, 0.79]	
Heterogeneity: Chi² = 3.43, df = 5	$5 (P = 0.63); I^2 = 0\%$				100 100
Test for overall effect: $Z = 4.24$ (F					0.01 0.1 1 100 100 100 100 Favours [experimental] Favours [control]
					EZ-LTA

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. metan logrr selogrr,	label(na	mevar=author)) fixed efor	m	6/bmjopen-2024-091507 on 18 March 2025 Erasmu by copyright, including for uses related to	
Study	ES	[95% Conf.	Interval]	% Weight	124-091 includi	
Carlotta Micaela Jar	0.960	0.469	1.965	7.74	507 o	
Carlotta Micaela Jar	0.780	0.426	1.427	10.88	r n 1	
Christopher Spankovi	0.610	0.409	0.909	25.01	ses Ma	
Diana Tang 2021a	0.470	0.290	0.761	17.13	arch Er	
Diana Tang 2021b	0.680	0.433	1.068	19.53	20: as n ted	
Diana Tang 2021d	0.690	0.440	1.081	19.72	25. Do nusho to te)	
I-V pooled ES	0.649	0.532	0.793	100.00	ownload gescho ct and da	
Actually: fruit: OR=0.649, [95%C	I 0.532, 0.793]				ded from htt lool . data mining,	
eFigure 6: Forest Plot Sl	nowing the	Association B	Setween fiber	and tinnitus.	http://b	
Black diamonds are the estimated priber: OR=0.92, [95%CI 0.85,0.99]			dom-effects meta-	analysis; Red box sizes	s reflect the relative with the apportioned	d to studies in the meta- analys
_		0	dds Ratio	Odd	Is Ratio	

				Odds Ratio		Odds	Ratio	nd
Study or Subgroup	log[Odds Ratio]	SE	Weight	IV, Random, 95% CI		IV, Rando	m, 95% CI	<u>s</u>
Diana Tang 2021a	-0.5108256	0.243222	2.3%	0.60 [0.37, 0.97]	8	-		<u>⊒</u> .
Diana Tang 2021b	-0.1392621	0.2282217	2.6%	0.87 [0.56, 1.36]	(a)	50-0	-	ilar t
Diana Tang 2021c	-0.2613648	0.2306047	2.5%	0.77 [0.49, 1.21]	69		- 80	tech
Doh Young Lee 2018	0.003992	0.0022879	27.8%	1.00 [1.00, 1.01]			•	Ę
Piers Dawes 2020a	-0.0304592	0.0527859	18.3%	0.97 [0.87, 1.08]		-	539	nologies
Piers Dawes 2020b	-0.0943106	0.0588071	16.9%	0.91 [0.81, 1.02]		-	t	gie
Piers Dawes 2020c	-0.1508229	0.0622392	16.1%	0.86 [0.76, 0.97]		=		Ñ
Piers Dawes 2020d	-0.1392621	0.0759266	13.4%	0.87 [0.75, 1.01]			1	
Total (95% CI)			100.0%	0.92 [0.85, 0.99]		•		
Heterogeneity: Tau² = (0.01; Chi² = 19.09, d	df = 7 (P = 0.0)	$(08); I^2 = 0$	63%	0.5	0.7	1 1.5	-
Test for overall effect: 2	Z = 2.21 (P = 0.03)				A000 00 TOX	100 March 100	Favours [co	ontroll
					i avodia (ex	penmental	i avodis įco	ALL OIL

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1	. metan logrr selogrr	, label(na	mevar=author) random efo	rm	<u>©</u> 7
2	Study	ES	[95% Conf.	Interval]	% Weight	1t, including
4 5	Diana Tang 2021a	0.600	0.372	0.966	2.31	9150
5	Diana Tang 2021b	0.870	0.556	1.361	2.59	——————————————————————————————————————
7	Diana Tang 2021d	0.770	0.490	1.210	2.54	
8	Doh Young Lee 2018	1.004	1.000	1.009	27.81	us es M
9	Piers Dawes 2020a	0.970	0.875	1.076	18.30	
10	Piers Dawes 2020b	0.910	0.811	1.021	16.90	arch 20 Erass
11	Piers Dawes 2020c	0.860	0.761	0.972	16.14	h 202 ated t
12 13	Piers Dawes 2020d	0.870	0.750	1.010	13.40	o te
14 15	D+L pooled ES	0.918	0.851	0.990	100.00	Downloaded odd and data
16 17	Actually: fruit: OR=0.918, [9	+ 05%CI	 <mark>0 9901</mark>	,~N) _	data
18	rectually. Hult. OK 0.910, [5	737001 0.031,	<u>0.770</u>].			m. fro
19						
20	E'	. (1)	43 A •	. D.		d, tt
21	eFigure 7: Forest Plo	ot Showing	g the Associ	ation Betwe	en tat and tinnit	18.
22						ain <u>ä</u> i
23	Black diamonds are the estin	nated pooled o	dd ratio (OR) for	r each random-e	ffects meta-analysis; Re	d box sizes reflect the relative what apportioned to studies in the meta- analysis.
24	Fat: OR=1.07, [95%CI 0.97,					a n. t.
25					Odds Ratio	Odds Ratio 2 3
26	Study or Subgroup	log[Odds	Ratio]	SE Weight IV,	Random, 95% CI	IV, Random, 95% 🖨 🙎

-0.3710637	0.170/122		IV, Random, 95% CI	IV, Random, 95% 🖨 🙎
	0.1734132	5.9%	0.69 [0.49, 0.98]	nila
0.0029955	0.0010173	27.8%	1.00 [1.00, 1.01]	† r
0.0582689	0.0574609	20.2%	1.06 [0.95, 1.19]	n May
0.0861777	0.0700094	17.8%	1.09 [0.95, 1.25]	hno
0.1739534	0.0832964	15.5%	1.19 [1.01, 1.40]	log 19,
0.285179	0.1010838	12.8%	1.33 [1.09, 1.62]	2025
		100.0%	1.07 [0.97, 1.18]	5 at
= 18.68, df = 5 (P =	= 0.002); I ² =	73%	70 NO.	
= 0.16)				0.5 0.7 1 1.5 ਨੂੰ2 Favours [experimental] Favours [comਫ਼ਾol]
				nen
				t GE
	0.0861777 0.1739534 0.285179 : 18.68, df= 5 (P=		0.0861777 0.0700094 17.8% 0.1739534 0.0832964 15.5% 0.285179 0.1010838 12.8% 100.0% 18.68, df = 5 (P = 0.002); l² = 73%	0.0861777 0.0700094 17.8% 1.09 [0.95, 1.25] 0.1739534 0.0832964 15.5% 1.19 [1.01, 1.40] 0.285179 0.1010838 12.8% 1.33 [1.09, 1.62] 100.0% 1.07 [0.97, 1.18] 18.68, df = 5 (P = 0.002); = 73%

Study	ES	[95% Conf.	Interval]	% Weight	
Christopher Spankovi	0.690	0.485	0.981	5.95	
Doh Young Lee 2018	1.003	1.001	1.005	27.75	
Piers Dawes 2020a	1.060	0.947	1.186	20.17	
Piers Dawes 2020b	1.090	0.950	1.250	17.81	
Piers Dawes 2020c	1.190	1.011	1.401	15.50	
Piers Dawes 2020d	1.330	1.091	1.621	12.82	
D+L pooled ES	1.072	0.973	1.181	100.00	

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Study	ES	[95% Conf.	Interval]] % Weight	t							
Christopher Spankovi	0.690	0.485	0.981	5.95)1507				
Doh Young Lee 2018	1.003	1.001	1.005	27.75			3	î on				
Piers Dawes 2020a	1.060	0.947	1.186	20.17			2					
Piers Dawes 2020b	1.090	0.950	1.250	17.81			ğ					
Piers Dawes 2020c	1.190	1.011	1.401	15.50			9	arc				
Piers Dawes 2020d	1.330	1.091	1.621	12.82			מופת	8 March 2025. Erasmus				
D+L pooled ES	1.072	0.973	1.181	100.00				25. Downloaded nushogeschool				
			ation Dat	10/h		: 4	ā E	d from htt				
Actually: fat: OR=1.072, [95% eFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI	t Showing	g the Associ dd ratio (OR) for 2=0% p=0.20.	each randon	. (alysis; Red box		ي Ratio	from http://bm.bht webpen.bmj	apportio	ned to st	tudies in	the meta- a
eFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI	t Showing ated pooled o 0.90,1.63], I	g the Associ dd ratio (OR) for 2=0% p=0.20.	seach randon SE Weight 302 3.0%	n-effects meta-ana Odds Ratio IV, Fixed, 95% CI 1.35 [0.25, 7.36]	alysis; Red box	sizes reflect t	ي Ratio	from http://bm.bht webpen.bmj	apportio	ned to st	tudies in	the meta- a
eFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Carlotta Micaela Jarach 2023	t Showing ated pooled o 0.90,1.63], I log[Odd: a 0.3 b 0.3	g the Associ dd ratio (OR) for the form of the period of	se Weight 502 3.0% 543 2.3%	Odds Ratio N, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89]	alysis; Red box	sizes reflect t	Ratio 9 , 95% CI 0	from http://bm.bht weben.bmj.com/ o	apportio	ned to st	tudies in	the meta- a
EFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Milena Tomanic 2020	t Showing ated pooled o 0.90,1.63], I log[Odd: a 0.3 b 0.3	g the Associ dd ratio (OR) fo. 2=0% p=0.20. s Ratiol 001046 0.8652	se Weight 602 3.0% 543 2.3% 309 94.7%	n-effects meta-ana Odds Ratio IV, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89] 1.20 [0.89, 1.63]	alysis; Red box	sizes reflect t	Ratio 9 , 95% CI 0	from http://bm.bht weben.bmj.com/ o	apportion	ned to st	tudies in	the meta- a
EFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Milena Tomanic 2020 Total (95% CI)	t Showing ated pooled o 0.90,1.63], I log[Odd: a	dd ratio (OR) for 2=0% p=0.20. SRatio 001046 0.8652 364722 0.9974 856494 0.154	se Weight 602 3.0% 543 2.3% 309 94.7%	Odds Ratio N, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89]	alysis; Red box	sizes reflect t	ي Ratio	from http://bm/bpen.bmj.com/ on May	apportion	ned to st	tudies in	the meta- a
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eFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Carlotta Micaela Jarach 2023 Milena Tomanic 2020 Total (95% CI) Heterogeneity: Chi² = 0.04, df	t Showing ated pooled o 0.90,1.63], I log[Odd: a	dd ratio (OR) for 2=0% p=0.20. SRatio 001046 0.8652 364722 0.9974 856494 0.154	se Weight 602 3.0% 543 2.3% 309 94.7%	n-effects meta-ana Odds Ratio IV, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89] 1.20 [0.89, 1.63]	alysis; Red box	Odds IV, Fixed	Ratio 95% CI 95% CI	from http://bm.pepen.bmj.com/ on May 19, 2025		ned to st	tudies in	the meta- a
eFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Carlotta Micaela Jarach 2023 Milena Tomanic 2020 Total (95% CI) Heterogeneity: Chi² = 0.04, df	t Showing ated pooled o 0.90,1.63], I log[Odd: a	dd ratio (OR) for 2=0% p=0.20. SRatio 001046 0.8652 364722 0.9974 856494 0.154	se Weight 602 3.0% 543 2.3% 309 94.7%	n-effects meta-ana Odds Ratio IV, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89] 1.20 [0.89, 1.63]	alysis; Red box	Odds IV, Fixed	Ratio 95% CI 95% CI	from http://bm.pepen.bmj.com/ on May 19, 2025		ned to st	tudies in	the meta- a
eFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Carlotta Micaela Jarach 2023 Milena Tomanic 2020 Total (95% CI) Heterogeneity: Chi² = 0.04, df	t Showing ated pooled o 0.90,1.63], I log[Odd: a	dd ratio (OR) for 2=0% p=0.20. SRatio 001046 0.8652 364722 0.9974 856494 0.154	se Weight 602 3.0% 543 2.3% 309 94.7%	n-effects meta-ana Odds Ratio IV, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89] 1.20 [0.89, 1.63]	alysis; Red box	Odds IV, Fixed	Ratio 95% CI 95% CI	from http://bm.bpen.bmj.com/ on May 19, 20		ned to st	tudies in	the meta- a

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Study	ES	[9!	5% Conf.	Interval]	% Weight	-09150 cluding	
Carlotta Micaela Ja	ar 1.35 0)	0.248	7.359	3.01	7 on 7	
Carlotta Micaela Ja	ar 1.400)	0.198	9.889	2.27	18 N	
			0.887	1.624	94.72	larch 20 Eras	
I-V pooled ES	1.208	3	0.900	1.622	100.00)25. Do	
	+					wnlo ges ano	
Actually: margarine: OR=1 208 [95%CL0 900_1 6	221				oade choc	
rictainy. margarine. Or 1.200,	2570010.500, 1.02	-2].				ed f	
						ni. rom	
eFigure 9: Forest Plot S	howing the A	ssociatio	n Between	n meat and tinn	itus.	ո http://	
Black diamonds are the estimated	pooled odd ratio (OR) for each	n random-effe	cts meta-analysis; Red	box sizes reflect the relative	weight apportioned to studies	in the meta- analysis.
		,				ing	•
			Ode	ds Ratio	Odds Ratio	, an.b	
Study or Subgroup	log[Odds Ratio]	SE	Weight IV, Fi	xed, 95% CI	IV, Fixed, 95% CI	<u>ā</u> <u>ā</u>	
Carlotta Micaela Jarach 2023a						in C	
Carlotta Micaela Jarach 2023b						n/ c	
	Carlotta Micaela Ja Carlotta Micaela Ja Milena Tomanic 2020 I-V pooled ES Actually: margarine: OR=1.208, Ja Black diamonds are the estimated Meat: OR=1.10, [95%CI 0.78,1.5] Study or Subgroup Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b	Carlotta Micaela Jar 1.356 Carlotta Micaela Jar 1.406 Milena Tomanic 2020 1.206 I-V pooled ES 1.208 Actually: margarine: OR=1.208, [95%CI 0.900, 1.62 eFigure 9: Forest Plot Showing the A Black diamonds are the estimated pooled odd ratio (Meat: OR=1.10, [95%CI 0.78,1.54], I²=0% p=0.59. Study or Subgroup log[Odds Ratio] Carlotta Micaela Jarach 2023a 0.3987761 -0.0304592	Carlotta Micaela Jar 1.350 Carlotta Micaela Jar 1.400 Milena Tomanic 2020 1.200 I-V pooled ES 1.208 Actually: margarine: OR=1.208, [95%CI 0.900, 1.622]. eFigure 9: Forest Plot Showing the Associatio Black diamonds are the estimated pooled odd ratio (OR) for each Meat: OR=1.10, [95%CI 0.78,1.54], I²=0% p=0.59. Study or Subgroup log[Odds Ratio] SE Carlotta Micaela Jarach 2023a 0.3987761 0.3484928 Carlotta Micaela Jarach 2023b -0.0304592 0.3287067	Carlotta Micaela Jar 1.350	Carlotta Micaela Jar 1.350 0.248 7.359 Carlotta Micaela Jar 1.400 0.198 9.889 Milena Tomanic 2020 1.200 0.887 1.624 I-V pooled ES 1.208 0.900 1.622 Actually: margarine: OR=1.208, [95%CI 0.900, 1.622]. PeFigure 9: Forest Plot Showing the Association Between meat and tinning Black diamonds are the estimated pooled odd ratio (OR) for each random-effects meta-analysis; Red Meat: OR=1.10, [95%CI 0.78,1.54], I²=0% p=0.59. Odds Ratio Study or Subgroup log[Odds Ratio] SE Weight IV, Fixed, 95% CI Carlotta Micaela Jarach 2023a 0.3987761 0.3484928 24.6% 1.49 [0.75, 2.95] Carlotta Micaela Jarach 2023b -0.0304592 0.3287067 27.6% 0.97 [0.51, 1.85]	Carlotta Micaela Jar 1.350 0.248 7.359 3.01 Carlotta Micaela Jar 1.400 0.198 9.889 2.27 Milena Tomanic 2020 1.200 0.887 1.624 94.72 I-V pooled ES 1.208 0.900 1.622 100.00 Actually: margarine: OR=1.208, [95%CI 0.900, 1.622]. eFigure 9: Forest Plot Showing the Association Between meat and tinnitus. Black diamonds are the estimated pooled odd ratio (OR) for each random-effects meta-analysis; Red box sizes reflect the relative Meat: OR=1.10, [95%CI 0.78,1.54], I²=0% p=0.59. Odds Ratio Study or Subgroup log Odds Ratio SE Weight V. Fixed, 95% CI V. Fixed, 95% CI Carlotta Micaela Jarach 2023a 0.3987761 0.3484928 24.6% 1.49 [0.75, 2.95] Carlotta Micaela Jarach 2023b -0.0304592 0.3287067 27.6% 0.97 [0.51, 1.85]	Carlotta Micaela Jar 1.350 0.248 7.359 3.01 0.248 7.359 3.01 0.248 7.359 3.01 0.248 7.359 3.01 0.248 7.359 3.01 0.248 7.359 3.01 0.248 7.359 3.01 0.248 0.248 7.359 3.01 0.248

Study or Subgroup	log[Odds Ratio]	SE	Weight	Odds Ratio IV, Fixed, 95% CI	Odds Ratio IV, Fixed, 95% CI	n.bm J, and	
Carlotta Micaela Jarach 2023a	0.3987761	0.3484928	24.6%	1.49 [0.75, 2.95]	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	sim :	
Carlotta Micaela Jarach 2023b	-0.0304592	0.3287067	27.6%	0.97 [0.51, 1.85]	-	ıila	
Christopher Spankovich 2017	0.0099503	0.2496967	47.8%	1.01 [0.62, 1.65]	3 - -	on I	
Total (95% CI)			100.0%	1.10 [0.78, 1.54]	•	May chno	
Heterogeneity: Chiz = 1.02, df = 1	$2 (P = 0.60); I^2 = 0\%$	i			0.01	<u>0</u> 1 0	400
Test for overall effect: Z = 0.55 (F	P = 0.59)				0.01 0.1 1 Favours [experimental] Favours	2025 at [@ntr5 at	100

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Study	ES	[95% Conf.	Interval]	% Weight	4-09150 acludin
Carlotta Micaela Jar Carlotta Micaela Jar Christopher Spankovi	1.490 0.970 1.010	0.753 0.509 0.619	2.950 1.847 1.648	24.56 27.60 47.84	7 on 18 March 20 Erasi g for uses related
I-V pooled ES	1.099	0.783	1.542	100.00	25. Dow nushoge to text a
Actually: meat: OR=1.099, [95%CI 0.783	3, 1.542].	MA		·	hloaded i school .

eFigure 10: Forest Plot Showing the Association Between sugar and tinnitus.

Black diamonds are the estimated pooled odd ratio (OR) for each random-effects meta-analysis; Red box sizes reflect the relative weight apportioned to studies in the meta-analysis. Sugar: OR=1.00, [95%CI 0.97,1.03], I²=0% p=0.84.

Study or Subgroup	log[Odds Ratio]	SE	Weight	Odds Ratio IV, Fixed, 95% CI	Odds Ratio a 5 IV, Fixed, 95% CI 3.
Abby McCormack 2014a	0	0.0230439	44.3%	1.00 [0.96, 1.05]	win is
Abby McCormack 2014b	0.0099503	0.0233327	43.2%	1.01 [0.96, 1.06]	ii Z
Abby McCormack 2014c	-0.0294288	0.0469906	10.7%	0.97 [0.89, 1.06]	r te on
Carlotta Micaela Jarach 2023a	-0.0725707	0.3247361	0.2%	0.93 [0.49, 1.76]	The Management of the Manageme
Carlotta Micaela Jarach 2023b	-0.210721	0.3237852	0.2%	0.81 [0.43, 1.53]	+ <u>5 3</u>
Diana Tang 2021a	-0.4462871	0.236286	0.4%	0.64 [0.40, 1.02]	• • • • • • • • • • • • • • • • • • •
Diana Tang 2021b	-0.0618754	0.2243772	0.5%	0.94 [0.61, 1.46]	- ii 20:
Diana Tang 2021c	-0.356675	0.2383442	0.4%	0.70 [0.44, 1.12]	9s.
Fotal (95% CI)			100.0%	1.00 [0.97, 1.03]	D _{ep}
Heterogeneity: Chi² = 6.89, df = 3	$7 (P = 0.44); I^2 = 0\%$,			
Test for overall effect: Z = 0.20 (F	9 = 0.84				0.7 0.85 1 1.2 물5 Favours [experimental] Favours [contr e l]
					avours [experimental]
					G E
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Study	ES	[95% Conf.	Interval]	% Weight	
Abby McCormack 2014	1.000	0.956	1.046	44.34	
Abby McCormack 2014a	1.010	0.965	1.057	43.25	
Abby McCormack 2014b	0.971	0.886	1.065	10.66	
Carlotta Micaela Jar	0.930	0.492	1.758	0.22	
Carlotta Micaela Jar	0.810	0.429	1.528	0.22	
Diana Tang 2021a	0.640	0.403	1.017	0.42	
Diana Tang 2021b	0.940	0.606	1.459	0.47	
Diana Tang 2021c	0.700	0.439	1.117	0.41	
I-V pooled ES	0.997	0.967	1.027	100.00	

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2	Study	E	S [95%	Conf.	Interval]	% Weight				
4 5	Abby McCormack 2014	1 1.00	ø e	956	1.046	44.34	1000)24-091507 on including for		
6	Abby McCormack 2014	la 1.01	9 6	.965	1.057	43.25		7 on		
7	Abby McCormack 2014	16 0.97	1 6	.886	1.065	10.66		n 18		
8	Carlotta Micaela Ja	er 0.93	9 8	.492	1.758	0.22		18 Ma		
9	Carlotta Micaela Ja	ar 0.81	0 0	.429	1.528	0.22		arci Feli		
10	Diana Tang 2021a	0.64	9 6	.403	1.017	0.42		h 20 ras		
11 12	Diana Tang 2021b	0.94		.606	1.459	0.47		D25 mu to		
13	Diana Tang 2021c	0.70		.439	1.117	0.41		. Dow shog text		
14 15 16	I-V pooled ES	0.99	7 6	967	1.027	100.00		March 2025. Downloaded from http://bmjop Erasmushogeschool es related to text and data mining, Al trainin		
22 23 24 25 26	eFigure 11: Forest I Black diamonds are the esti Fish: OR=1.00, [95%CI 1.0	mated pooled	odd ratio (OI		ch random-effects		pox sizes reflect the relative	ဖြင့် v မွှောwe မျှောht apporti	ioned to studies in the meta-analy	sis.
27	Cturbs or Cuberous Io	alOddo Datiol	er.	Majabi	Odds Ratio	1	Odds Ratio	j.com/ simila		
28	Study or Subgroup lo Doh Young Lee 2018	g[Odds Ratio]			IV, Fixed, 95% CI	(a)	V, Fixed, 95% CI			
29	Piers Dawes 2020a		0.0007634 0.0546964		1.00 [1.00, 1.00] 1.02 [0.92, 1.14]		—	ech		
30	Piers Dawes 2020b	0.0190020	0.060906		1.01 [0.90, 1.14]			May 19, chnolog		
31 32	Piers Dawes 2020c	-0.0304592			0.97 [0.85, 1.11]		4	ın May 19, 202 technologies.		
33	Piers Dawes 2020d		0.0858348		1.06 [0.90, 1.25]			2025 jies.		
34										
35	Total (95% CI)			100.0%	1.00 [1.00, 1.00]			Ď		
36	Heterogeneity: Chi ² = 0.78,		5.00			0.01 0.1	1 10	a 00		
37	Test for overall effect: $Z = 2$.62 (P = 0.009)					nental] Favours [control]	T T		
38								ent		
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41 42 43					oudour only best /	//amaiana ana la mai ara m	site/about/guidelines.xhtn	at Department GEZ-LTA		

Study	ES .	[95% Conf. Interval]	% Weight
Doh Young Lee 2018	1.002	1.001 1.004	99.94
Piers Dawes 2020a	1.020	0.91 6 1.135	0.02
Piers Dawes 2020b	1.010	0.896 1.138	0.02
Piers Dawes 2020c	0.970	0.849 1.108	0.01
Piers Dawes 2020d	1.060	0.896 1.254	0.01
I-V pooled ES	1.002	1.001 1.004	100.00

Abby McCormack 2014b -0.09431 Abby McCormack 2014c 0.07696 Carlotta Micaela Jarach 2023a 0.17395 Carlotta Micaela Jarach 2023b -0.28768	1.001 0.916 0.896 0.849 0.896 1.001	1.000 1.133 1.133 1.100 1.256	al] % We: 4 99 5 0 8 0 4 0 4 100 ween fish and	94 02 02 01 01 00 tinnitus.	izes reflect the	Erasmushogeschool . for uses related to text and data mining, Al tr	ht appor	rtioned to s	studies in the me	eta-analy
Doh Young Lee 2018 1.002 Piers Dawes 2020a 1.020 Piers Dawes 2020b 1.010 Piers Dawes 2020c 0.970 Piers Dawes 2020d 1.060 I-V pooled ES 1.002 Actually: protein: OR=1.002, [95%CI 1.001, 1.00] Black diamonds are the estimated pooled odd ra Fish: OR=0.98, [95%CI 0.91,1.05], I²=72% p=0 Study or Subgroup log[Odds Ration Abby McCormack 2014a -0.02020 -0.09431 Abby McCormack 2014c 0.07696 Carlotta Micaela Jarach 2023a 0.17395 Carlotta Micaela Jarach 2023b -0.28768	1.001 0.916 0.896 0.849 0.896 1.001	1.00 1.13 1.13 1.10 1.25 1.00	4 99 5 0 8 0 8 0 4 0 4 100 veen fish and	94 02 02 01 01 00 tinnitus.	izes reflect the	Erasmushogeschool . for uses related to text and data mining, Al tr	on 18 March 2025. Downloaded from http://bmgbor	rtioned to s	studies in the me	eta-anal
Piers Dawes 2020a 1.020 Piers Dawes 2020b 1.010 Piers Dawes 2020c 0.970 Piers Dawes 2020d 1.060 I-V pooled ES 1.002 Actually: protein: OR=1.002, [95%CI 1.001, 1.0 Black diamonds are the estimated pooled odd ra Fish: OR=0.98, [95%CI 0.91,1.05], I²=72% p=0 Study or Subgroup log[Odds Ration of the compact	0.916 0.896 0.849 0.896 1.001 004].	1.13 1.10 1.25 1.00 tion Betw	yeen fish and	02 02 01 01 00 tinnitus.	izes reflect the	Erasmushogeschool . for uses related to text and data mining, Al tr	on 18 March 2025. Downloaded from http://bmgbor	rtioned to s	studies in the me	eta-anal
Piers Dawes 2020b 1.010 Piers Dawes 2020c 0.970 Piers Dawes 2020d 1.060 I-V pooled ES 1.002 Actually: protein: OR=1.002, [95%CI 1.001, 1.0 eFigure 12: Forest Plot Showing the Plant of State Plot Showing the Plant of State Plot Showing the State Plot Showing the Plant of State Plant of	0.896 0.849 0.896 1.001 004].	1.13; 1.10; 1.25; 1.00;	8 0 8 0 4 0 4 100 veen fish and	02 01 01 00 tinnitus.	 izes reflect the	Erasmushogeschool . uses related to text and data mining, Al tr	March 2025. Downloaded from http://bngbl	rtioned to s	studies in the me	eta-anal
Piers Dawes 2020c 0.970 Piers Dawes 2020d 1.060 I-V pooled ES 1.002 Actually: protein: OR=1.002, [95%CI 1.001, 1.00] 1.002 Black diamonds are the estimated pooled odd ratesh: OR=0.98, [95%CI 0.91,1.05], I²=72% p=0 1.000 Study or Subgroup log[Odds Rate 1.00] Abby McCormack 2014a -0.02020 Abby McCormack 2014b -0.09431 Abby McCormack 2014c 0.07696 Carlotta Micaela Jarach 2023a 0.17395 Carlotta Micaela Jarach 2023b -0.28768	0.849 0.896 1.001 004].	1.100 1.250 1.000	veen fish and	01 01 00 tinnitus.	 izes reflect the	Erasmushogeschool . related to text and data mining, Al tr	March 2025. Downloaded from http://bngbl	rtioned to s	studies in the me	eta-anal
Piers Dawes 2020d 1.060 I-V pooled ES 1.002 Actually: protein: OR=1.002, [95%CI 1.001, 1.00] eFigure 12: Forest Plot Showing the Black diamonds are the estimated pooled odd ra Fish: OR=0.98, [95%CI 0.91,1.05], I²=72% p=0 Study or Subgroup log[Odds Ration	0.896 1.001 004]. tio (OR) for each	1.256 1.006	veen fish and	01 00 tinnitus.	 izes reflect the	=	ht appor	rtioned to s	studies in the me	eta-anal
Piers Dawes 2020d 1.060 I-V pooled ES 1.002 Actually: protein: OR=1.002, [95%CI 1.001, 1.00] eFigure 12: Forest Plot Showing the Black diamonds are the estimated pooled odd ra Fish: OR=0.98, [95%CI 0.91,1.05], I²=72% p=0 Study or Subgroup log[Odds Ration	0.896 1.001 004]. tio (OR) for each	1.256 1.006	veen fish and	01 00 tinnitus.	izes reflect the	=	ht appor	rtioned to s	studies in the me	eta-anal
Actually: protein: OR=1.002, [95%CI 1.001, 1.00] eFigure 12: Forest Plot Showing the Black diamonds are the estimated pooled odd rate Fish: OR=0.98, [95%CI 0.91,1.05], I²=72% p=0 Study or Subgroup log[Odds Rate	he Associat	tion Betw	veen fish and	tinnitus.	izes reflect the	=	ht appor	rtioned to s	studies in the me	eta-anal
eFigure 12: Forest Plot Showing the Electric Showing the Plot Showing the Showing t	he Associat		ffects meta-analys		izes reflect the	=	ht appor	rtioned to s	studies in the me	eta-anal
Study or Subgroup log[Odds Rate] Abby McCormack 2014a -0.02020 Abby McCormack 2014b -0.09431 Abby McCormack 2014c 0.07696 Carlotta Micaela Jarach 2023a 0.17395 Carlotta Micaela Jarach 2023b -0.28768	1.51.		Odds Ratio							
Abby McCormack 2014a -0.02020 Abby McCormack 2014b -0.09431 Abby McCormack 2014c 0.07696 Carlotta Micaela Jarach 2023a 0.17395 Carlotta Micaela Jarach 2023b -0.28768	iol CE	Minimulat IV			Odds	g, Ratio a m, 95% €I	oen.bm			
Abby McCormack 2014b -0.09431 Abby McCormack 2014c 0.07696 Carlotta Micaela Jarach 2023a 0.17395 Carlotta Micaela Jarach 2023b -0.28768	27 0.0181367	5,6700,770,770	7, Random, 95% CI 0.98 [0.95, 1.02]		iv, Kandoi	m, 95% &i				
Abby McCormack 2014c 0.07696 Carlotta Micaela Jarach 2023a 0.17395 Carlotta Micaela Jarach 2023b -0.28768	06 0.0197415		0.91 [0.88, 0.95]		-	similar	.com/			
Carlotta Micaela Jarach 2023b -0.28768	11 0.0404261	25.8%	1.08 [1.00, 1.17]		5	# # #	on			
	34 0.3557993	1.0%	1.19 [0.59, 2.39]	-	- 23	- 2	Мау			
Milene Temenia 2020	21 0.3132832		0.75 [0.41, 1.39]	•	- 2	<u> </u>	<u>ب</u> ر			
Milena Tomanic 2020 0.0039	92 0.1847285	3.6%	1.00 [0.70, 1.44]			ologies.	19 , 2			
Total (95% CI)		100.0%	0.98 [0.91, 1.05]		•	es.	2025			
Heterogeneity: Tau ² = 0.00; Chi ² = 18.17, df = 5 ((P = 0.003); P = 7		0.50 [0.51, 1.65]	- 1	- I		명 (명 :5	+		
Test for overall effect: Z = 0.57 (P = 0.57)					0.7 1 [experimental]	1 Favours [c		2		
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Study	ES	[95% Conf.	Interval]	% Weight	
Abby McCormack 2014 Abby McCormack 2014a	0.980 0.910	0.946 0.875	1.015 0.946	35.43 34.93	
Abby McCormack 2014b	1.080	0.998	1.169	27.04	
Carlotta Micaela Jar Carlotta Micaela Jar	1.190 0.750	0.593 0.406	2.390 1.386	1.14 1.46	
D+L pooled ES	0.979	0.907	1.056	100.00	

Page	e 49 of 75				BM.	J Open	в Бу со	36/bmjope			
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2 3 4	Study	ES	[95% Cor	nf. Ir	nterval]	% Weight	, including for	-2024-091507			
5	Abby McCormack 2014	0.980	0.946	6	1.015	35.43	ling f				
6 7	Abby McCormack 2014a	0.910	0.875	5	0.946	34.93		on `			
8	Abby McCormack 2014b	1.080	0.998	8	1.169	27.04	uses	<u>8</u>			
9	Carlotta Micaela Jar	1.190	0.593	3	2.390	1.14	re	larc E			
10 11	Carlotta Micaela Jar	0.750	0.406	6	1.386	1.46	related	18 March 2025. Erasmu			
12 13	D+L pooled ES	+ 0.979	0.907	 7	1.056	100.00	~				
14		+					and	Downloaded			
15 16	Actually: fish: OR=0.979, [95%C	t 0.907, 1.056].					da	bade thoc			
17		,,					ta n	. ₹. . ₹.			
18							<u>a</u> i.	m O			
19 20	eFigure 13: Forest Plot	Showing the	Associati	ion Be	tween vegeta	able and tinnitus.	ng,	htt			
21	8	8					A E	p://l			
22	Black diamonds are the estimated	pooled odd ratio	(OR) for eac	h randon	n-effects meta-ana	alysis; Red box sizes refle	ct the relatives	veitht appo	rtioned to st	udies in the m	eta- analysis.
23	Vegetable: OR=1.10, [95%CI 0.9	1,1.34], I ² =0% p=	=0.33				ing	bpe			-
24 25	1000 St 52500	ta ratestas astronomia	9 80005	\$99000000	Odds Ratio		ds Ratio and ced, 95% CI	n.b			
26	Study or Subgroup	log[Odds Ratio]		- Party (1000) (1000)	IV, Fixed, 95% CI	IV, Fix	ced, 95% Cl o	<u>bm</u>			
27	Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b	-0.2613648 -0.2876821	0.3602729		0.77 [0.38, 1.56] 0.75 [0.40, 1.41]	- 10 <u>- 10 - 10 - 10 - 10 - 10 - 10 - 10</u>	similar	com/			
28	Christopher Spankovich 2017		0.321390		1.25 [0.89, 1.76]		ar t	on V			
29	Diana Tang 2021a		0.2411069		1.32 [0.82, 2.12]	9 0	tec				
30	Diana Tang 2021b	-0.0304592			0.97 [0.60, 1.56]		• no	ау			
31	Diana Tang 2021c		0.2357803		1.19 [0.75, 1.89]	95	¢hnologies	May 19,			
32 33	T. J. 1 (05) (0)			400.0%	4 40 50 04 4 043		ies.	2025			
34	Total (95% CI)	/D 0.53) 13 00/		100.0%	1.10 [0.91, 1.34]	i i		Ω Ω	- 1		
35	Heterogeneity: Chi ² = 3.88, df = 5 Test for overall effect: Z = 0.98 (P		i			0.2 0.5	1 2	Ď	5		
36	Test for overall effect. Z = 0.98 (P	= 0.33)				Favours [experimenta	al] Favours [cor	ntr © l]			
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Study	ES	[95% Conf.	Interval:] % Weight	including	24-091	
Carlotta Micaela Jar	0.770	0.380	1.560	7.56			
Carlotta Micaela Jar	0.750	0.399	1.408	9.50	for u	on 1	
Christopher Spankovi	1.250	0.886	1.763	31.89	IS eg	8	
Diana Tang 2021a	1.320	0.823	2.117	16.88		/lar	
Diana Tang 2021b	0.970	0.602	1.564	16.52	Era:	1 <u>G</u>	
Diana Tang 2021c	1.190	0.750	1.889	17.65	smus	2025.	
I-V pooled ES	1.101	0.907	1.337	100.00	Erasmushogeschool . uses related to text and data mining, Al tra	Down	
+					ichoc id da	loade	
Actually: vegetable: OR=1.101,	[95%CI 0.907	<mark>7, 1.337]</mark> .			ta r	·ଧ୍ର	
					n in	ror	
					ing	<u> </u>	
eFigure 14: Forest Plot	C				= •	<u>,</u>	
Black diamonds are the estimate	ed pooled odd	ratio (OR) for eac	h random-effe	ects meta-analysis; Red box sizes re	eflect the relative	to studies in	the meta- analysis.
Water: OR=1.00, [95%CI 0.99,1	.01], 12–20%		Odds Ratio	Odds Ratio	and	ı.bn	
Study or Subgroup log	[Odds Ratio]	SE Weight IV		IV, Fixed, 95% CI	<u>୫.</u>	<u>a.</u>	
Carlotta Micaela Jarach 2023a Doh Young Lee 2018 Milena Tomanic 2020	-0.1743534 0.3 0.0029955 0.0 0.1889661 0.3	0055957 99.8% 1	.84 [0.43, 1.65] .00 [0.99, 1.01] .21 [0.95, 1.54]	-	similar te	.bmj.com/ on May	
Total (95% CI)		100.0% 1	00 [0.99, 1.01]			Ma	
Heterogeneity: Chi ² = 2.50, df = 2 (P =	0.29); F= 20%	100.071	. [0.00, 1.01]	0.5 0.7 1 1.5	technologies.	y 19,	
Test for overall effect: Z = 0.59 (P = 0.5				0.5 0.7 1 1.5 Favours [experimental] Favours [contr	oll G	,- 20	
					ý	2025	
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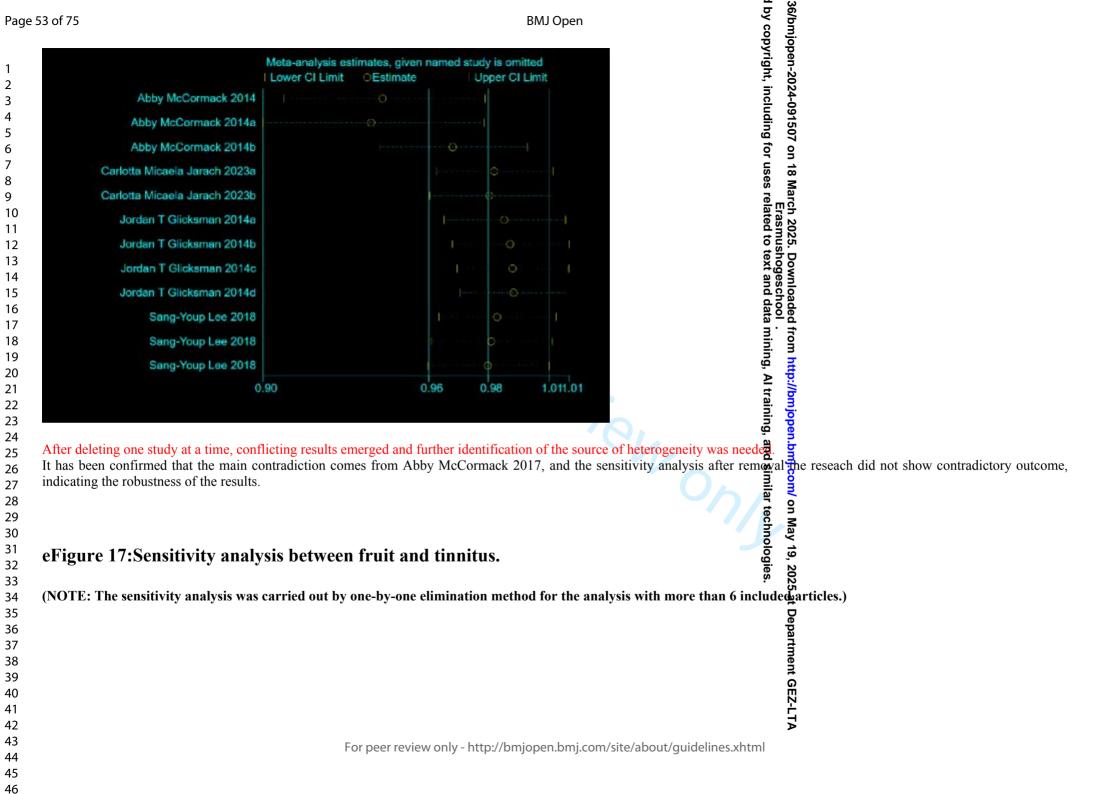
log[Odds Ratio]	SE	Weight	IV, Fixed, 95% CI		s Ratio <u>d,</u> 95% CI
-0.1743534	0.3430473	0.0%	0.84 [0.43, 1.65]	3	The second secon
0.0029955	0.0055957	99.8%	1.00 [0.99, 1.01]		
0.1889661	0.1243716	0.2%	1.21 [0.95, 1.54]	-	
		100.0%	1.00 [0.99, 1.01]		•
$(P = 0.29); P = 20^\circ$	X ₀			05 07	1 15 2
= 0.55)				Favours [experimental]	Favours [control]
	-0.1743534 0.0029955 0.1889661	-0.1743534 0.3430473 0.0029955 0.0055957 0.1889661 0.1243716	-0.1743534 0.3430473 0.0% 0.0029955 0.0055957 99.8% 0.1889661 0.1243716 0.2% (P = 0.29); P = 20%	Dog[Odds Ratio] SE Weight IV, Fixed, 95% CI -0.1743534 0.3430473 0.0% 0.84 [0.43, 1.65] -0.0029955 0.0055957 99.8% 1.00 [0.99, 1.01] -0.1889661 0.1243716 0.2% 1.21 [0.95, 1.54]	log[Odds Ratio] SE Weight IV, Fixed, 95% Cl IV, Fixed -0.1743534 0.3430473 0.0% 0.84 [0.43, 1.65] 0.0029955 0.0055957 99.8% 1.00 [0.99, 1.01] 0.1889661 0.1243716 0.2% 1.21 [0.95, 1.54] -1.00 [0.99, 1.01] 0.00% 1.00 [0.99, 1.01] 0.5 0.7

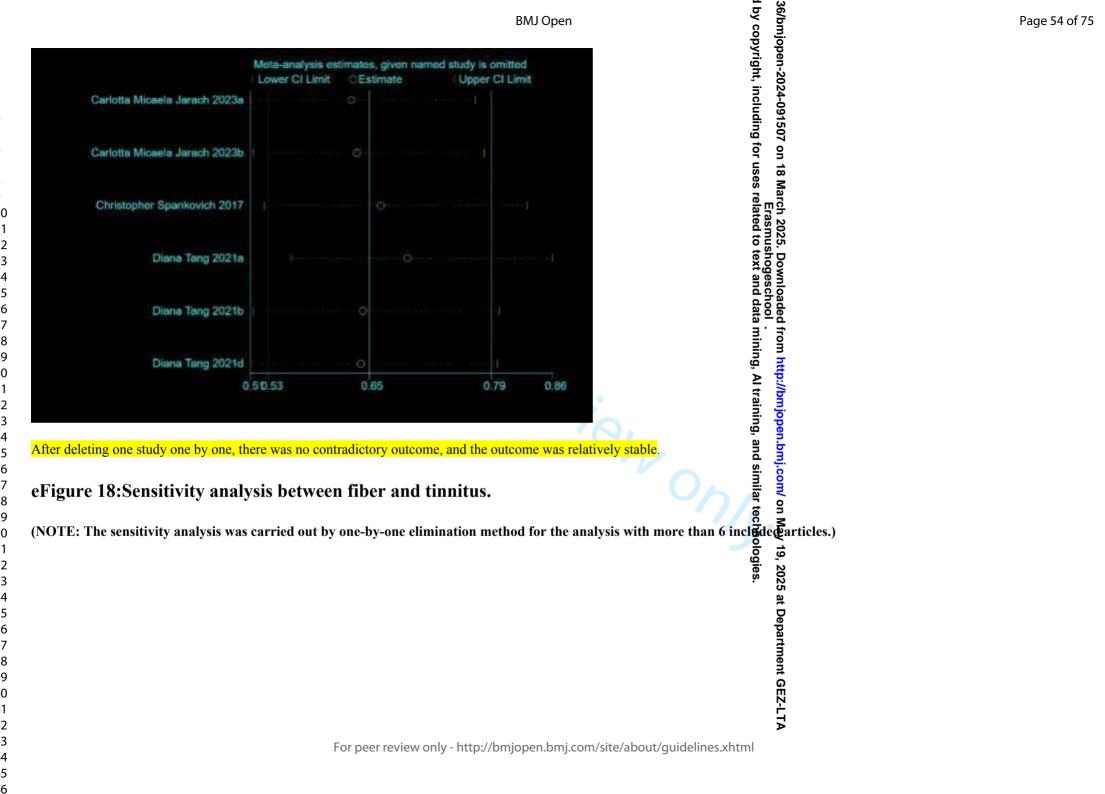
. metan logrr selog	,,				njopen-2024 opyright, in		
Study	ES	[95% Conf.	Interval]	% Weight	24-09150 includinç		
Carlotta Micaela Ja		0.429	1.645	0.03	7 on 18		
Ooh Young Lee 2018	1.003	0.992	1.014	99.77	18 Ma		
Milena Tomanic 2020	1.210	0.950	1.541	0.21	rch 20 Eras elatec		
I-V pooled ES	1.003	0.992	1.014	100.00	725. Dov		
Actually: water: OR=1.003, [95%C]	· +	<i>(</i>) _			/hload escho		
ordany. water. Of 1.003, [73700]	1.0.772, 1.017 _] .				ted fi ool . ata n		
					from hi		
Figure 15: Forest Plot Sl	howing the Asso	ciation Between	dairy and tinniti	10	nc <mark>-</mark>		
8	0		uan y and unint	45.	=		
	<u> </u>		10.		, Al t		
Black diamonds are the estimated po	ooled odd ratio (OR) fo		10.		, Al t	ortioned to stud	lies in the meta- ana
Black diamonds are the estimated po	ooled odd ratio (OR) fo		10.		, Al t	ortioned to stud	lies in the meta- and
Black diamonds are the estimated po	ooled odd ratio (OR) fo	or each random-effects	meta-analysis; Red box		tp://bmbht appoiveiveiveive	ortioned to stud	lies in the meta- and
Black diamonds are the estimated polary: OR=0.83, [95%CI 0.77,0.89]	pooled odd ratio (OR) fo , I ² =0% p<0.00001		10.	sizes reflect the relati	tp://bmbht appoiveiveiveive	ortioned to stud	lies in the meta- and
Black diamonds are the estimated polaring: OR=0.83, [95%CI 0.77,0.89] Study or Subgroup log[Odd] Abby McCormack 2014a -0.1	pooled odd ratio (OR) for p<0.00001 s Ratio SE Weight SE Weig	Odds Ratio N, Fixed, 95% CI 0.85 [0.75, 0.95]	meta-analysis; Red box Odds Ratio	sizes reflect the relati	tp://bmbht appoiveiveiveive	ortioned to stud	lies in the meta- and
Black diamonds are the estimated polarity: OR=0.83, [95%CI 0.77,0.89] Study or Subgroup log[Odd: Abby McCormack 2014a -0.1 Abby McCormack 2014b -0.2	pooled odd ratio (OR) for p<0.00001 s Ratio SE Weight	Odds Ratio N, Fixed, 95% Cl	meta-analysis; Red box Odds Ratio	sizes reflect the relati	tp://bmbht appoiveiveiveive	ortioned to stud	lies in the meta- and
Study or Subgroup log[Odd: Abby McCormack 2014b Abby McCormack 2014b Abby McCormack 2014c -0.1	pooled odd ratio (OR) for p<0.00001 s Ratio SE Weight 655144 0.0603033 41.2 390169 0.0582753 44.1 310283 0.1153023 11.3	Odds Ratio N, Fixed, 95% Cl	meta-analysis; Red box Odds Ratio	sizes reflect the relati	tp://bmbht appoiveiveiveive	ortioned to stud	lies in the meta- and
Study or Subgroup log[Odd: Abby McCormack 2014a -0.1 Abby McCormack 2014b -0.2 Abby McCormack 2014c -0.1 Christopher Spankovich 2017	s Ratiol SE Weig 655144 0.0603033 41.2 390169 0.0582753 44.1 310283 0.1153023 11.3 -0.0101 0.2069 3.5	Odds Ratio N, Fixed, 95% CI 0.85 [0.75, 0.95] 0.79 [0.70, 0.88] 0.88 [0.70, 1.10] 0.99 [0.66, 1.49]	meta-analysis; Red box Odds Ratio	sizes reflect the relati	tp://bmbht appoiveiveiveive	ortioned to stud	lies in the meta- and
Slack diamonds are the estimated polarity: OR=0.83, [95%CI 0.77,0.89] Study or Subgroup log[Odd: Abby McCormack 2014a -0.1 Abby McCormack 2014b -0.2 Abby McCormack 2014c -0.1 Christopher Spankovich 2017 Total (95% CI)	s Ratio SE Weight SE Weigh	Odds Ratio N, Fixed, 95% CI 0.85 [0.75, 0.95] 0.79 [0.70, 0.88] 0.88 [0.70, 1.10]	Odds Ratio	sizes reflect the relati	tp://bræjopen.bmj.com/ on May 19, Al trauning, and similar technolog	ortioned to stud	lies in the meta- and
Study or Subgroup logfOdd: Abby McCormack 2014b Abby McCormack 2014b Abby McCormack 2014b Abby McCormack 2014c -0.1	s Ratio SE Weight SE Weigh	Odds Ratio ht IV, Fixed, 95% CI % 0.85 [0.75, 0.95] % 0.79 [0.70, 0.88] % 0.88 [0.70, 1.10] % 0.99 [0.66, 1.49] 0.83 [0.77, 0.89]	Odds Ratio	sizes reflect the relati	appoint appoin	ortioned to stud	lies in the meta- ana
Study or Subgroup log[Odd: Abby McCormack 2014a -0.1 Abby McCormack 2014b -0.2 Abby McCormack 2014c -0.1 Christopher Spankovich 2017 Total (95% CI) Heterogeneity: Chi² = 1.89, df = 3 (P = 0.60	s Ratio SE Weight SE Weigh	Odds Ratio ht IV, Fixed, 95% CI % 0.85 [0.75, 0.95] % 0.79 [0.70, 0.88] % 0.88 [0.70, 1.10] % 0.99 [0.66, 1.49] 0.83 [0.77, 0.89]	Odds Ratio N, Fixed, 95%	sizes reflect the relati	tp://bræjopen.bmj.com/ on May 19, Al trauning, and similar technolog	ortioned to stud	lies in the meta- and
Study or Subgroup log[Odd: Abby McCormack 2014a -0.1 Abby McCormack 2014b -0.2 Abby McCormack 2014c -0.1 Christopher Spankovich 2017 Total (95% CI) Heterogeneity: Chi² = 1.89, df = 3 (P = 0.60	s Ratio SE Weight SE Weigh	Odds Ratio ht IV, Fixed, 95% CI % 0.85 [0.75, 0.95] % 0.79 [0.70, 0.88] % 0.88 [0.70, 1.10] % 0.99 [0.66, 1.49] 0.83 [0.77, 0.89]	Odds Ratio N, Fixed, 95%	sizes reflect the relati	tp://bræjopen.bmj.com/ on May 19, 2025 at Dep , Al trayning, and similar technologies.	ortioned to stud	lies in the meta- and
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Study or Subgroup log[Odd: Abby McCormack 2014a -0.1 Abby McCormack 2014b -0.2 Abby McCormack 2014c -0.1 Christopher Spankovich 2017 Total (95% CI) Heterogeneity: Chi² = 1.89, df = 3 (P = 0.60	s Ratio SE Weight SE Weigh	Odds Ratio ht IV, Fixed, 95% CI % 0.85 [0.75, 0.95] % 0.79 [0.70, 0.88] % 0.88 [0.70, 1.10] % 0.99 [0.66, 1.49] 0.83 [0.77, 0.89]	Odds Ratio N, Fixed, 95%	sizes reflect the relati	tp://bræjopen.bmj.com/ on May 19, 2025 at Dep , Al trayning, and similar technologies.	ortioned to stud	lies in the meta- and
Study or Subgroup log[Odd: Abby McCormack 2014a -0.1 Abby McCormack 2014b -0.2 Abby McCormack 2014c -0.1 Christopher Spankovich 2017 Total (95% CI) Heterogeneity: Chi² = 1.89, df = 3 (P = 0.60	s Ratio SE Weight SE Weigh	Odds Ratio ht IV, Fixed, 95% CI % 0.85 [0.75, 0.95] % 0.79 [0.70, 0.88] % 0.88 [0.70, 1.10] % 0.99 [0.66, 1.49] 0.83 [0.77, 0.89]	Odds Ratio N, Fixed, 95%	sizes reflect the relati	tp://bræjopen.bmj.com/ on May 19, 2025 at Dep , Al trayning, and similar technologies.	ortioned to stud	lies in the meta- and
Study or Subgroup log[Odd: Abby McCormack 2014a -0.1 Abby McCormack 2014b -0.2 Abby McCormack 2014c -0.1 Christopher Spankovich 2017 Total (95% CI) Heterogeneity: Chi² = 1.89, df = 3 (P = 0.60	s Ratio SE Weight SE Weigh	Odds Ratio ht IV, Fixed, 95% CI % 0.85 [0.75, 0.95] % 0.79 [0.70, 0.88] % 0.88 [0.70, 1.10] % 0.99 [0.66, 1.49] 0.83 [0.77, 0.89]	Odds Ratio N, Fixed, 95%	sizes reflect the relati	tp://bræjopen.bmj.com/ on May 19, Al trauning, and similar technolog	ortioned to stud	lies in the meta- and
Study or Subgroup log[Odd: Abby McCormack 2014a -0.1 Abby McCormack 2014b -0.2 Abby McCormack 2014c -0.1 Christopher Spankovich 2017 Total (95% CI) Heterogeneity: Chi² = 1.89, df = 3 (P = 0.60	s Ratiol SE Weig 655144 0.0603033 41.2 390169 0.0582753 44.1 310283 0.1153023 11.3 -0.0101 0.2069 3.5 100.6	Odds Ratio Mt. IV, Fixed, 95% CI 0.85 [0.75, 0.95] 0.79 [0.70, 0.88] 0.88 [0.70, 1.10] 0.99 [0.66, 1.49] 0.83 [0.77, 0.89] F	Odds Ratio N, Fixed, 95%	ci	pp. ttp://bragopen.bmj.com/ on May 19, 2025 at Department GEZ-LTA e Al trayning, and similar technologies.	ortioned to stud	lies in the meta- and

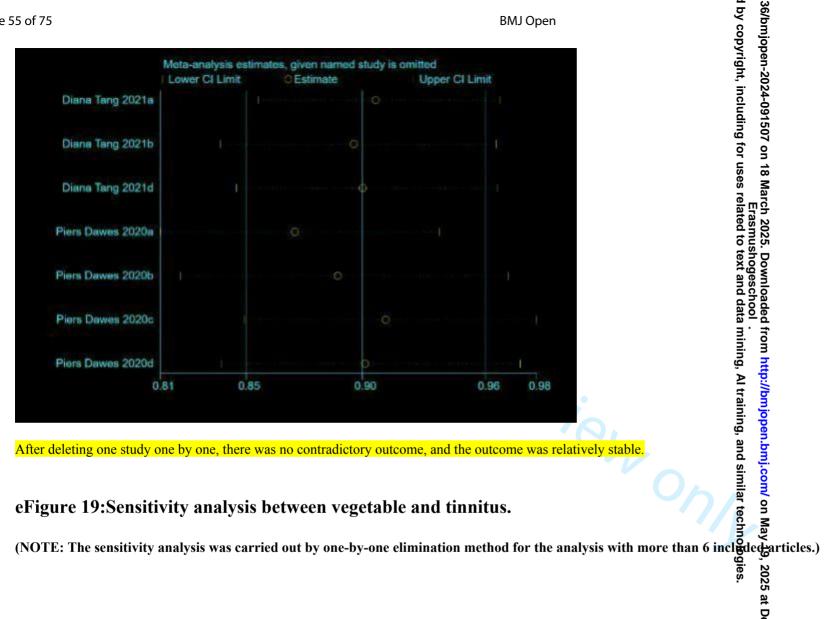
		-		Odds Ratio	Odds Ratio
Study or Subgroup	log[Odds Ratio]	SE	Weight	IV, Fixed, 95% CI	IV, Fixed, 95% CI
Abby McCormack 2014a	-0.1655144	0.0603033	41.2%	0.85 [0.75, 0.95]	-
Abby McCormack 2014b	-0.2390169	0.0582753	44.1%	0.79 [0.70, 0.88]	-
Abby McCormack 2014c	-0.1310283	0.1153023	11.3%	0.88 [0.70, 1.10]	-
Christopher Spankovich 2017	-0.0101	0.2069	3.5%	0.99 [0.66, 1.49]	-
Total (95% CI)			100.0%	0.83 [0.77, 0.89]	•
Heterogeneity: Chi2 = 1.89, df =	3 (P = 0.60); F = 09	6		-	05 07 15 0
Test for overall effect: $Z = 4.87$ (0.5 0.7 1 1.5 2 Favours [experimental] Favours [control]

Page 52 of 75

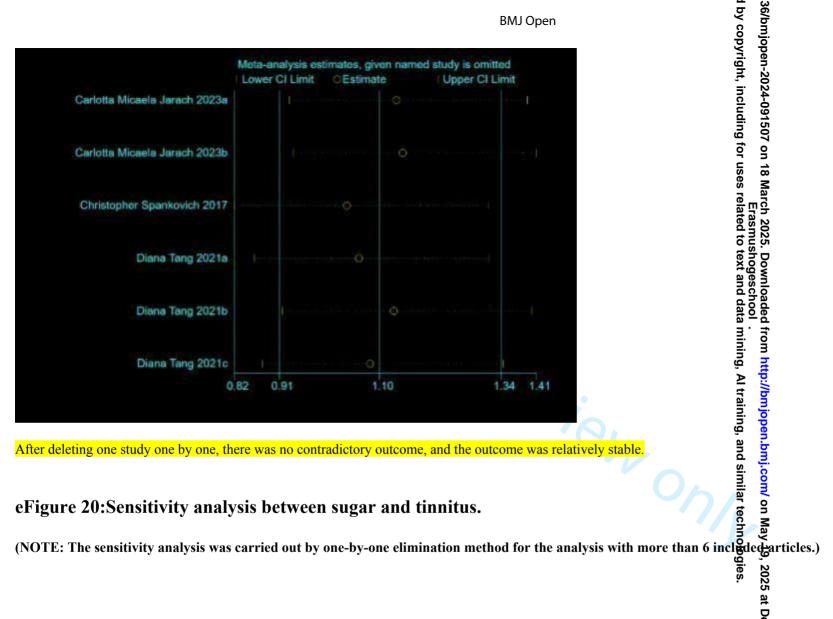
	-+		Interval]		ling
bby McCormack 2014	4.54			41.62	on 1 for u
bby McCormack 2014a				44.21	8 Ma
bby McCormack 2014b	A CONTRACTOR OF THE PARTY OF TH				arch Er rela
hristopher Spankovi		0.631			36/bmjopen-2024-091507 on 18 March 2025. Downlo Erasmushogesc I by copyright, including for uses related to text and
-V pooled ES		0.766			. Downloaded from http: shogeschool . text and data mining, A
NOTE: The sensitivity analysis	was carried out by	one-by-one eliminat	tion method for the	analysis with more than	n 6 incladeda
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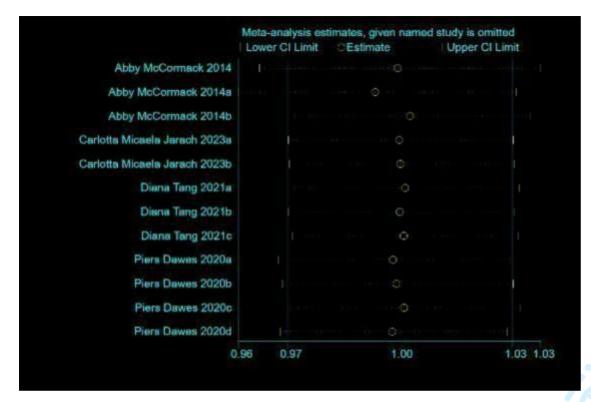




, 2025 at Department GEZ-LTA

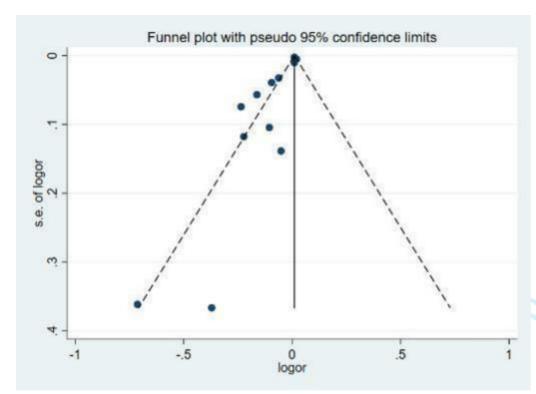


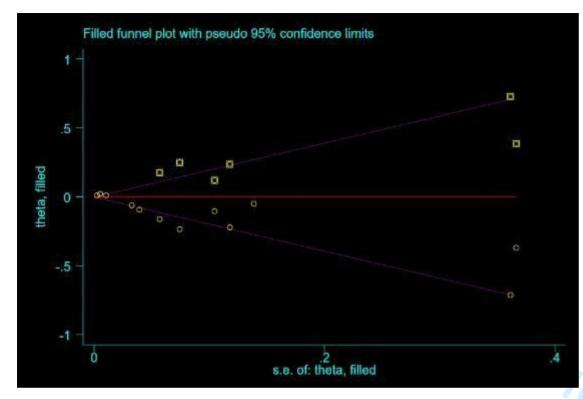
2025 at Department GEZ-LTA



After deleting one study one by one, there was no contradictory outcome, and the outcome was relatively stable.

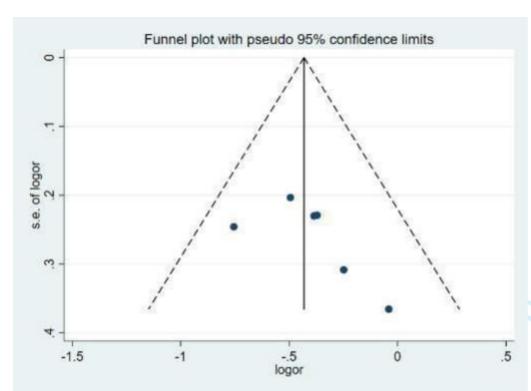
eFigure 21:Publication bias and Egger test on caffeine





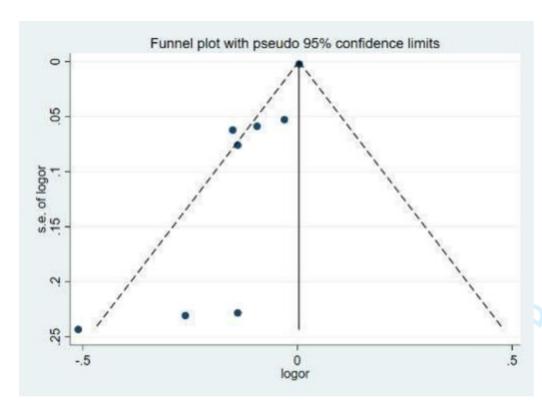
Cut and complement method tips, there was no significant publication bias.

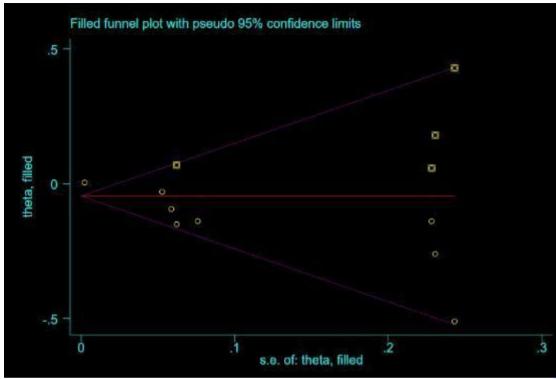
eFigure 22: Publication bias and Egger test on fruit



Egger test: Fruit p=0.205>0.05, there was no significant publication bias.

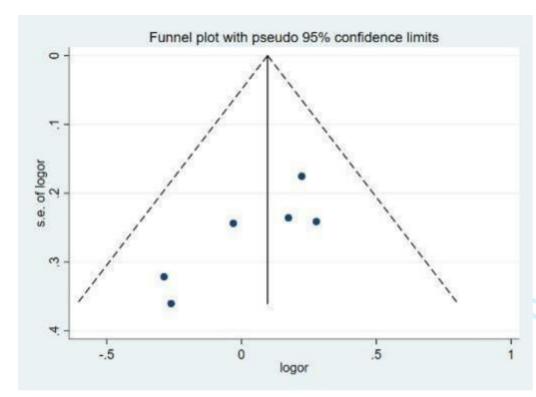
eFigure 23:Publication bias and Egger test on fiber

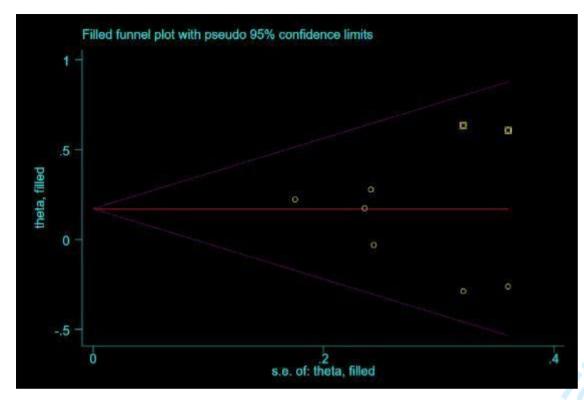




Egger test: Fruit p=0.006<0.05. Cut and complement method tips, there was no significant publication bias.

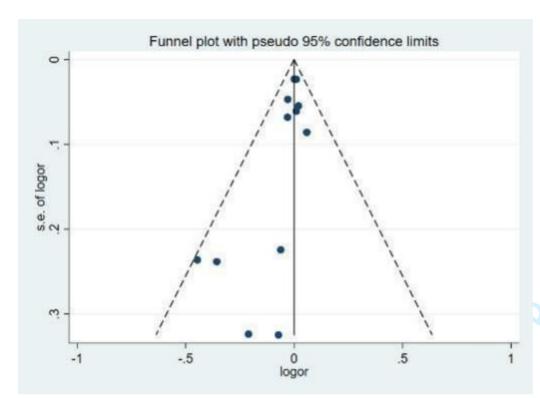
eFigure 24:Publication bias and Egger test on vegetable.

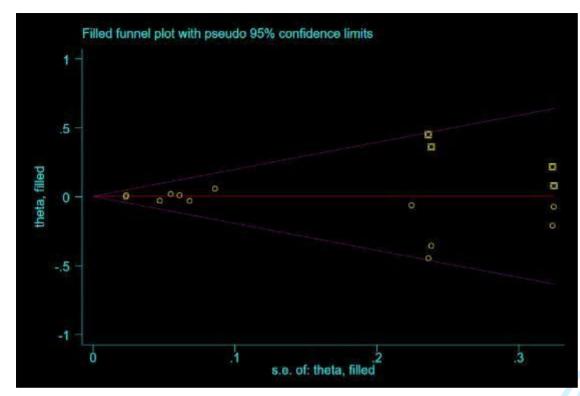




Egger test: Fruit p=0.041<0.05. Cut and complement method tips, there was no significant publication bias.

eFigure 25:Publication bias and Egger test on sugar.

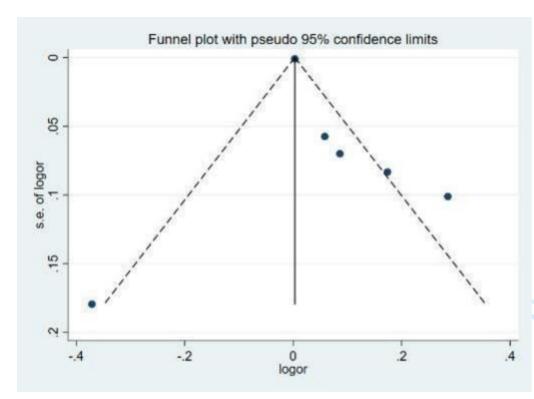




Egger test: Fruit p=0.035<0.05. Cut and complement method tips, there was no significant publication bias.

36/bmjopen-2024-091507 on 18 March 2025. Downloaded from http://bmjopen.bmj.com/ on May 19, 2025 at Department GEZ-LTA Erasmushogeschool . I by copyright, including for uses related to text and data mining, Al training, and similar technologies.

eFigure 26:Publication bias and Egger test on fat.



Egger test: Fat p=0.306>0.05, there was no significant publication bias.

eTable 1. Meta-analysis of Observational Studies in Epidemiology (MOOSE) Checklist

Item No.	Recommendation Recommendation	Reported on Page No
Repo	rting of background should include	
1	% X	3-5
2	Hypothesis statement	3-5
3	Description of study outcome(s)	3-5
4	Type of exposure or intervention used	3-5
5	Hypothesis statement Description of study outcome(s) Type of exposure or intervention used Type of study designs used Study population	-
6	Study population	5
Repo	rting of search strategy should include	
7	Qualifications of searchers (eg. librarians and investigators)	6
8	Search strategy, including time period included in the synthesis and keywords	6
9	Effort to include all available studies, including contact with authors	6, 7
10	Databases and registries searched	5,6
11	Search software used, name and version, including special features used (eg, explosion)	8
12	Use of hand searching (eg, reference lists of obtained articles)	6
13	List of citations located and those excluded, including justification	6, Fig 1
14	Method of addressing articles published in languages other than English	7
15	Method of handling abstracts and unpublished studies	6, 7
16	Description of any contact with authors	-
Repo	rting of methods should include	
	p:	

9 of 75	BMJ Open BMJ Open BMJ Open Description of relevance or appropriateness of studies assembled for assessing the hypothesis to be testedding Pationals for the selection and coding of data (e.g. sound clinical principles or convenience)	
17	Description of relevance or appropriateness of studies assembled for assessing the hypothesis to be tested 6. 91.	8
18	Rationale for the selection and coding of data (eg, sound clinical principles or convenience)	7-8
19	Documentation of how data were classified and coded (eg, multiple raters, blinding and interrater reliability)	7
20	Assessment of confounding (eg. comparability of cases and controls in studies where appropriate)	7
21	Assessment of study quality, including blinding of quality assessors, stratification or regression on possible study results Assessment of heterogeneity Description of statistical methods (eg, complete description of fixed or random effects models, justification of statistical methods)	7
22	Assessment of heterogeneity	8
23	Description of statistical methods (eg, complete description of fixed or random effects models, justification of whether the	8
	Description of statistical methods (eg, complete description of fixed or random effects models, justification of her the chosen models account for predictors of study results, dose-response models, or cumulative meta-analysis) and the detail to be replicated	
24	Provision of appropriate tables and graphics	Table 1, Fig 1
Repo		
25	Graphic summarizing individual study estimates and overall estimate	Fig 2, Table 1
26	Table giving descriptive information for each study included	eTable2
27	Results of sensitivity testing (eg, subgroup analysis)	eFig16-20
28	Indication of statistical uncertainty of findings rting of discussion should include	10,11
Repo	Results of sensitivity testing (eg, subgroup analysis) Indication of statistical uncertainty of findings rting of discussion should include	
29	Quantitative assessment of bias (eg, publication bias)	eFig21-26
30	Justification for exclusion (eg, exclusion of non-English language citations)	Fig 1
31	Assessment of quality of included studies	eTable 5
Repo	rting of conclusions should include	
32	Consideration of alternative explanations for observed results	11-19
33	Generalization of the conclusions (ie, appropriate for the data presented and within the domain of the literature ஷ்ல்iew)	11-19

			<u> </u>
34	Guidelines for future research	/righ	19-20
35	Disclosure of funding source	਼ੌਜ਼ ਤ	1
Table 2	2: Dietary risk ratio associated with tinnitus	ng for u	-091507 on 18

eTable 2: Dietary risk ratio associated with tinnitus

	1				<u> </u>	
Carlotta Micaela Jarach 2023a	scarce	butter	tinnitus	0.98	0.44 A	1.77
Carlotta Micaela Jarach 2023b	normal use or high use	butter	tinnitus	0.46	rch 2025. Erasmus elated to	0.93
Diana Tang 2021a	2nd quartile (>188.4–231.7)	carbohydrate	tinnitus	0.74	5. Downshog	1.17
Diana Tang 2021b	3rd quartile (231.8– 280.8)	carbohydrate	tinnitus	0.739	5. Downloaded	1.15
Diana Tang 2021c	4th quartile (>280.8– 577.7)	carbohydrate	tinnitus	0.55		0.9
Doh Young Lee 2018	direct	carbohydrate	tinnitus	1.001	0. 2 99 🔀	1.001
Piers Dawes 2020a	quintile 2	Carbohydrate	tinnitus	1.03	0 .2 4	1.14
Piers Dawes 2020b	quintile 3	Carbohydrate	tinnitus	0.98	0.38 8	1.11
Piers Dawes 2020c	quintile 4	Carbohydrate	tinnitus	0.99	0.36 G	1.14
Piers Dawes 2020d	quintile 5	Carbohydrate	tinnitus	0.93		1.1
Carlotta Micaela Jarach 2023a	50-100g/week	cheese	tinnitus	1.29	0.33 3	2.67
Carlotta Micaela Jarach 2023b	100+g/week	cheese	tinnitus	0.85	0 3 6 8	1.58
Abby McCormack 2014	direct	coffee	Transient tinnitus	1.020	1.@10 n 1.@10 n	1.031
Abby McCormack 2014a	direct	coffee	Persistent tinnitus	1.010	1. @ 10 n	1.020
Abby McCormack 2014b	direct	coffee	Bothersome tinnitus	1.010	0.500 2	1.031
Carlotta Micaela Jarach 2023a	2nd quartile (850- 1749mg)	coffee	tinnitus	0.49	19, 2025 blogles.	0.99
Carlotta Micaela Jarach 2023b	3rd quartile (≥1750mg)	coffee	tinnitus	0.69	0.34 at D	1.43
Jordan T Glicksman 2014a	150-299 mg/day	coffee	tinnitus	0.94	0.88	1
Jordan T Glicksman 2014b	300-449 mg/day	coffee	tinnitus	0.91	0.84	0.98
Jordan T Glicksman 2014c	450-599 mg/day	coffee	tinnitus	0.85	0.76	0.95

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Jordan T Glicksman 2014d	600+ mg/day	coffee	tinnitus	0.79	0 3 8 pen	0.91
Sang-Youp Lee 2018	Age 19–39 (Daily)	coffee	tinnitus	0.8	-2024- ht;4nc	1
Sang-Youp Lee 2018	Age 40-64 (Daily)	coffee	tinnitus	0.9	0.23 91	1.1
Sang-Youp Lee 2018	Age >65 (Daily)	coffee	tinnitus	0.95	0 4 2 507	1.24
Abby McCormack 2014	direct	dairy	Transient tinnitus	0.847	0.952 🖺	0.752
Abby McCormack 2014a	direct	dairy	Persistent tinnitus	0.787	0. § 85 &	0.704
Abby McCormack 2014b	direct	dairy	Bothersome tinnitus	0.877	1. 6 99 ar	0.699
Christopher Spankovich 2017	direct	dairy	Persistent tinnitus	0.99	0 蒙 [[] S	1.50
Carlotta Micaela Jarach 2023a	16-19	diversity	tinnitus	0.53	202 0.4 0.4	1
Carlotta Micaela Jarach 2023b	≥20	diversity	tinnitus	0.47	0.345.0	0.9
Abby McCormack 2014	direct	egg	Transient tinnitus	1.031	1. F49 8	0.926
Abby McCormack 2014a	direct	egg	Persistent tinnitus	1.149	1. 2 98 nlo	1.031
Abby McCormack 2014b	direct	egg	Bothersome tinnitus	0.901	1. and a de	0.719
Carlotta Micaela Jarach 2023a	1/week	eggs	tinnitus	0.99	0.31 to	1.92
Carlotta Micaela Jarach 2023b	2+/week	eggs	tinnitus	0.54	March 2025. Downloaded from Secretary in the second of th	1
Christopher Spankovich 2017	direct	fat	Persistent tinnitus	0.69	0 9 49	0.99
Doh Young Lee 2018	direct	fat	tinnitus	1.003	1. 📆 1 💃	1.005
Piers Dawes 2020a	quintile 2	fat	tinnitus	1.06	09/5	1.19
Piers Dawes 2020b	quintile 3	fat	tinnitus	1.09	0 .3 5 💆	1.25
Piers Dawes 2020c	quintile 4	fat	tinnitus	1.19	1.491	1.40
Piers Dawes 2020d	quintile 5	fat	tinnitus	1.33	1.99 💆	1.62
Diana Tang 2021a	2nd quartile (>17.8– 23.8)	fiber	tinnitus	0.6	jopen.bmj.com/ o niag, an desimitar	0.96
Diana Tang 2021b	3rd quartile (>23.8– 30.6)	fiber	tinnitus	0.87	imitar technologies	1.37
Diana Tang 2021d	4th quartile (>30.6– 89.3)	fiber	tinnitus	0.77	010g es. 999 at 0.999	1.21
Doh Young Lee 2018	direct	fiber	tinnitus	1.004	0.999 م	1.008
Piers Dawes 2020a	quintile 2	fiber	tinnitus	0.97	0.87 D	1.07
Piers Dawes 2020b	quintile 3	fiber	tinnitus	0.91	0.81 a	1.02
Piers Dawes 2020c	quintile 4	fiber	tinnitus	0.86	0.76 mm 0.75 mm	0.97
Piers Dawes 2020d	quintile 5	fiber	tinnitus	0.87	0.75	1.01

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Abby McCormack 2014	direct	fish	Transient tinnitus	0.980	0. 6 50 en	1.020
Abby McCormack 2014a	direct	fish	Persistent tinnitus	0.910	0. \$ 70 \(\frac{1}{2}\)	0.940
Abby McCormack 2014b	direct	fish	Bothersome tinnitus		0.80	1.160
Carlotta Micaela Jarach 2023a	300g/week	fish	tinnitus	1.19	091507 091507	2.38
Carlotta Micaela Jarach 2023b	≥450g/week	fish	tinnitus	0.75		1.4
Carlotta Micaela Jarach 2023a	900-1050g/week	fruit	tinnitus	0.96	0. 9 7 S	1.97
Carlotta Micaela Jarach 2023b	≥1200g/week	fruit	tinnitus	0.78	0 .≅ 3 ≥	1.44
Christopher Spankovich 2017	direct	fruit	Persistent tinnitus	0.61	0. 8 1 a	0.91
Diana Tang 2021a	0.2)		tinnitus	0.47	ch 202 Erasm Plated	0.76
Diana Tang 2021b	3rd quartile (>6.2– 9.7)	fruit	tinnitus	0.68	15. Doviushog to text	1.06
Diana Tang 2021d	4th quartile (>9.7– 43.9)	fruit	tinnitus	0.69	18 March 2025. Downloaded Erasmushogeschool, usestelated to text and data	1.08
Carlotta Micaela Jarach 2023a	scarce	margarine	tinnitus	1.35	0 2 5 2	7.43
Carlotta Micaela Jarach 2023b	normal use or high use	margarine	tinnitus	1.4	from http 0.75	9.98
Carlotta Micaela Jarach 2023a	300g/week	meat	tinnitus	1.49	0.75	2.94
Carlotta Micaela Jarach 2023b	≥450g/week	meat	tinnitus	0.97	0. 5 1 🗟	1.85
Christopher Spankovich 2017	direct	meat	Persistent tinnitus	1.01	0 3 2 😽	1.65
Carlotta Micaela Jarach 2023a	2nt quartile (1-6 cops/week)	milk	tinnitus	0.68	pen.bn ng _ເ ງີສກດ	1.52
Carlotta Micaela Jarach 2023b	3rt quartile (7+ cops/week)	milk	tinnitus	0.85	0 simila (201 on	1.55
Doh Young Lee 2018	direct	protein	tinnitus	1.002	1.001 9	1.004
Piers Dawes 2020a	quintile 2	protein	tinnitus	1.02	0,942 ≤	1.14
Piers Dawes 2020b	quintile 3	protein	tinnitus	1.01	0 \$ 2 May 1	1.13
Piers Dawes 2020c	quintile 4	protein	tinnitus	0.97	0.85 %	1.11
Piers Dawes 2020d	quintile 5	protein	tinnitus	1.06	0.9 25	1.26
Abby McCormack 2014	direct	suger	Transient tinnitus	1.000	0.952	1.042
Abby McCormack 2014a	direct	suger	Persistent tinnitus	1.010	0.971 த	1.064
Abby McCormack 2014b	direct	suger	Bothersome tinnitus	0.971	0.885	1.064
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Carlotta Micaela Jarach 2023a	2nt quartile (1-7 spoon/week)	suger	tinnitus	0.93	oen-20; /right,	1.75
Carlotta Micaela Jarach 2023b	3rt quartile (8+ spoon/week)	suger	tinnitus	0.81	oen-2024-091507 on ⁄ri∰t, inc∰uding∯or	1.53
Diana Tang 2021a	2nd quartile (>91.0– 120.1)	suger	tinnitus	0.64	incfluding for uses	1.01
Diana Tang 2021b	3rd quartile (>120.1– 154.0)	suger	tinnitus	0.94	18 Mai uses r	1.47
Diana Tang 2021c	4th quartile (>154.0– 350.8)	suger	tinnitus	0.7	March 2025. Downloaded fro	1.12
Piers Dawes 2020a	quintile 2	suger	tinnitus	1.02	0 3 25 5	1.14
Piers Dawes 2020b	quintile 3	suger	tinnitus	1.01	0 % & &	1.13
Piers Dawes 2020c	quintile 4	suger	tinnitus	0.97	0 33 65 0	1.11
Piers Dawes 2020d	quintile 5	suger	tinnitus	1.06		1.26
Christopher Spankovich 2017	direct	variety	Persistent tinnitus	0.95	0 ₹ Ç₹	1.5
Carlotta Micaela Jarach 2023a	900-1050g/week	vegetable	tinnitus	0.77	0 m 8 m 1 m 1 m 1 m 1 m 1 m 1 m 1 m 1 m 1	1.56
Carlotta Micaela Jarach 2023b	≥1200g/week	vegetable	tinnitus	0.75	@ <u></u> 4 <u>₹</u>	1.41
Christopher Spankovich 2017	direct	vegetable	Persistent tinnitus	1.25	020	1.79
Diana Tang 2021a	2nd quartile (>7.2– 9.7)	vegetable	tinnitus	1.32	tp://bmjopen	2.11
Diana Tang 2021b	3rd quartile (>9.7– 12.3)	vegetable	tinnitus	0.97	0.890	1.56
Diana Tang 2021c	4th quartile (>12.3– 54.5)	vegetable	tinnitus	1.19	l simila	1.89
Abby McCormack 2014	direct	vegetable and fruit	Transient tinnitus	1.000	1.0000	1.010
Abby McCormack 2014a	direct	vegetable and fruit	Persistent tinnitus	1.010	1. Ġ 00 ౖ a	1.010
Abby McCormack 2014b	direct	vegetable and fruit	Bothersome tinnitus	1.010	1 € 00 ÷	1.020
Carlotta Micaela Jarach 2023a	>1 liter/per day	water	tinnitus	0.84	0.73 2	1.65
Doh Young Lee 2018	direct	water	tinnitus	1.003	0.992 25	1.014
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Table 3. Evalua	tion of Risl	c of Bias U s	sing Nev	vcastle-(Scale (I	NOS) fo	r Observ	š a	es
Study	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Tasm 2021	Total
Carlotta Micaela Jarach 2023	*	*	*	*	*	*	*	*	rch 2825. Downloaded from http://bmjopen Erasmushogeschool elatedto text and data mining, Al training,	8
Diana Tang 2021	*	*	*		*	*	*	*	load scho nd da	8
Milena Tomanic 2020	*	*	*		0,		*		led from	4
Piers Dawes 2020	*	*	*		*	*	*		n ht	6
Sang-Yeon Lee 2019	*	*	*		*	*	*		tp://bn Al tra	6
Doh Young Lee 2018	*	*	*		*	*	*		njopen ining,	6
Sang-Youp Lee 2018	*	*	*		*	*	*		.bmj.c	6
Christopher Spankovich 2017	*	*	*		*	*	*	0)	n.bmj.com/ on May 19, 2025 and similar technologies.	6
Abby McCormack 2014	*	*	*		*	*	*		May 1	6
Jordan T Glicksman 2014	*	*	*		*	*	*		9, 202 * ogies.	7

eTable 4. Literature screening process

75 of 75	BMJ Open	36/bmjoj d by copy
eTable 4. Literature screening process		36/bmjopen-2024-09150g of the distribution of
Title	Author	Include
The Role of Diet in Tinnitus Onset: A Hospital-Based Case-Control Study from Italy.	Carlotta Micaela Jarach 2023	18 Warch 2025. ⊞ Eraşmus use≼related to t
Associations between intake of dietary flavonoids and the 10-year incidence of tinnitus in older adults.	Diana Tang 2022	h 2025. Trasmus ated to
Dietary Fibre Intake and the 10-Year Incidence of Tinnitus in Older Adults.	Diana Tang 2021	. Downlo shogesc text and
Relationship Between Diet, Tinnitus, and Hearing Difficulties.	Piers Dawes 2020	oaded Speol d'Arata
Association of Chocolate Consumption with Hearing Loss and Tinnitus in Middle-Aged People Based on the Korean National Health and Nutrition Examination Survey 2012-2013.	Sang-Yeon Lee 2019	d from http://bm.jopec.bmj.com/ on May 19,2025 at Department 日 日 日 日 日 日 日 日 日 日 日 日 日 日 日 日 日 日 日
Relationship Between Diet and Tinnitus: Korea National Health and Nutrition Examination Survey.	Doh Young Lee 2018	o://bonjo Al traini
Association of Coffee Consumption with Hearing and Tinnitus Based on a National Population-Based Survey	Sang-Youp Lee 2018	pegan Egyand
Relationship between dietary quality, tinnitus and hearing level: data from the national health and nutrition examination survey, 1999-2002.	Christopher Spankovich 2017	j.com/ E Isimmilar
Association of dietary factors with presence and severity of tinnitus in a middle-aged UK population.	Abby McCormack 2014	onoMay E te≿hno
A prospective study of caffeine intake and risk of incident tinnitus	Jordan T. Glicksman 2014	19 <u>,2</u> 02 E blogites.
The effect of MemoVigor 2 on recent-onset idiopathic tinnitus: a randomized double-blind placebo-controlled clinical trial.	Dimitrios G Balatsouras 2024	5 at Der N
The effects of dietary and physical activity interventions on tinnitus symptoms: An RCT.	Ümüş Özbey-Yücel 2023	oartmen N

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Effectiveness of Tinnitan Duo in Subjective Tinnitus with Emotional Affectation: A Prospective, Interventional Study.	Jennifer Knäpper 2023	open-202 Nayright, ii
Hyperlipidemia and its relation with tinnitus: Cross-sectional approach.	A Musleh 2022	in objective in the second se
Diet Quality and the Risk of Impaired Speech Reception Threshold in Noise: The UK Biobank cohort	Humberto Yévenes-Briones 2022	24-091507 on nectuding for
The effect of caffeine on tinnitus: Randomized triple-blind placebo- controlled clinical trial.	Alleluia Lima Losno Ledesma 2021	n 18 Ma Nor uses i
The effects of diet and physical activity induced weight loss on the severity of tinnitus and quality of life: A randomized controlled trial.	Ümüş Özbey-Yücel 2021	rch 202 Erasm elated
Dietary Factors and Tinnitus among Adolescents.	Milena Tomanic 2020	6 40 C
Restriction of salt, caffeine and alcohol intake for the treatment of Ménière's disease or syndrome.	Kiran Hussain 2018	ownloa ogesch ext and
The effect of supplemental dietary taurine on tinnitus and auditory discrimination in an animal model.	Thomas J Brozoski 2010	aded fro 100/. data mi
Low energy diet and intracranial pressure in women with idiopathic intracranial hypertension: prospective cohort study.	Alexandra J Sinclair 2010	ining, Al
Caffeine abstinence: an ineffective and potentially distressing tinnitus therapy.	Lindsay St Claire 2010	//bmjopen
The role of endogenous Antisecretory Factor (AF) in the treatment of Meniere's Disease: A two-year follow-up study. Preliminary results.	Pasquale Viola 2020	and s
Caffeine intake and Meniere's disease: Is there relationship?	Inés Sánchez-Seller 2018	<u>s</u> Nog
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Association of fifteen common dietary factors with tinnitus: a systematic review and meta-analysis of observational studies

Article Type: Original research Date Submitted by the Author: 28-Jan-2025 Complete List of Authors: Zhang, Mengni; Chengdu University of Traditional Chinese Medicine, Wang, Xiaocui; Hospital of Chengdu University of Traditional Chinese Medicine, He, Xinyi; Chengdu University of Traditional Chinese Medicine, He, Xinyi; Chengdu University of Traditional Chinese Medicine Chen, Xi; Hospital of Chengdu University of Traditional Chinese Medicine Wang, Lu; Hospital of Chengdu University of Traditional Chinese Medicine Wang, Lu; Hospital of Chengdu University of Traditional Chinese Medicine Fu, Qinwei; Hospital of Chengdu University of Traditional Chinese Medicine Wang, Li; Hospital of Chengdu University of Traditional Chinese Medicine Fu, Qinwei; Hospital of Chengdu University of Traditional Chinese Medicine Hedicine Medicine Jiang, yanjie; Nanjing University of Traditional Chinese Medicine, Hospital of Chengdu University of Traditional Chinese Medicine, Traditional Chinese Medicine, Hospital of Chengdu University of Traditional Chinese Medicine, Sciences <a href="https://doi.org/10.1001/nc.1001/n</th><th>Journal:</th><th>BMJ Open</th></tr><tr><td>Date Submitted by the Author: 28-Jan-2025 Zhang, Mengni; Chengdu University of Traditional Chinese Medicine, Wang, Xiaocui; Hospital of Chengdu University of Traditional Chinese Medicine Zhang, Shipeng; Hospital of Chengdu University of Traditional Chinese Medicine, He, Xinyi; Chengdu University of Traditional Chinese Medicine Chen, Xi; Hospital of Chengdu University of Traditional Chinese Medicine Wang, Lu; Hospital of Chengdu University of Traditional Chinese Medicine Fu, Li; Hospital of Chengdu University of Traditional Chinese Medicine Wang, hanyu; Chengdu University of Traditional Chinese Medicine Jiang, yanjie; Nanjing University of Chinese Medicine Li, Xinrong; Hospital of Chengdu University of Traditional Chinese Medicine Zhang, Qinxiu; Chengdu University of Traditional Chinese Medicine, Hospital of Chengdu University of Traditional Chinese Medicine, School of Medical and Life Sciences Secondary Subject Heading: Ear, nose and throat/otolaryngology Secondary Subject Heading: OTOLARYNGOLOGY, NUTRITION & DIETETICS, Meta-Analysis, </td><td>Manuscript ID</td><td>bmjopen-2024-091507.R2</td></tr><tr><td>Complete List of Authors: Zhang, Mengni; Chengdu University of Traditional Chinese Medicine, Wang, Xiaocui; Hospital of Chengdu University of Traditional Chinese Medicine Zhang, Shipeng; Hospital of Chengdu University of Traditional Chinese Medicine, He, Xinyi; Chengdu University of Traditional Chinese Medicine Chen, Xi; Hospital of Chengdu University of Traditional Chinese Medicine Wang, Lu; Hospital of Chengdu University of Traditional Chinese Medicine Fu, Li; Hospital of Chengdu University of Traditional Chinese Medicine wang, hanyu; Chengdu University of Traditional Chinese Medicine Fu, Qinwei; Hospital of Chengdu University of Traditional Chinese Medicine Jiang, yanjie; Nanjing University of Chinese Medicine Li, Xinrong; Hospital of Chengdu University of Traditional Chinese Medicine Zhang, Qinxiu; Chengdu University of Traditional Chinese Medicine, Hospital of Chengdu University of Traditional Chinese Medicine; Chengdu University of Traditional Chinese Medicine, School of Medical and Life Sciences sciences Secondary Subject Heading: Nutrition and metabolism OTOLARYNGOLOGY, NUTRITION & DIETETICS, Meta-Analysis,<td>Article Type:</td><td>Original research</td>	Article Type:	Original research
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	Secondary Subject Heading:	Nutrition and metabolism
	Keywords:	

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 findings.

criteria for aggregate grade strength assessment. This study adhered to the guidelines of the Preferred Reporting Project (PRISMA) and Meta-Analysis of Epidemiological Observational Studies (MOOSE), as well as the PROSPERO Registry protocols. A mixed-effects model combined maximum adjusted estimates, with heterogeneity measured using the I² statistic. Sensitivity analysis validated the robustness of the analysis, and publication bias was assessed qualitatively and quantitatively. **Results** A total of 10 retrospective studies were identified and included in this analysis, with the last eight studies incorporated into the meta-analysis. Fifteen dietary factors were examined. Fruit intake, dietary fiber, caffeine, and dairy product consumption were negatively correlated with tinnitus incidence (OR = 0.649, [95% CI 0.532, 0.793], p<0.0001), (OR = 0.918, [95% CI 0.851, 0.990], p = 0.03), (OR = 0.898, [95% CI 0.862, 0.935], p

Conclusions This systematic review and meta-analysis suggest a link between particular dietary elements and a lower incidence of tinnitus.

<0.00001), (OR = 0.827, [95% CI, 0.766 to 0.892], p <0.00001),

respectively. A sensitivity analysis confirmed the robustness of the

- **PROSPERO registration number** CRD42023493856
- **Keywords:** Diet; Tinnitus; Food intake; Nutrition; Odds ratio

STRENGTHS AND LIMITATIONS OF THIS STUDY

- This study conducted a thorough literature screening, assessed the quality of the literature based on international standards, and excluded articles with a high risk of bias.
- This review involves a large population base, improving its representation of fundamental population characteristics and ensuring relatively reliable outcomes.
- There was minimal heterogeneity among the studies regarding the main observations, ensuring the solidity of the findings.
- The relatively small number of included articles may have led to certain conventionally accepted beneficial dietary factors (such as vegetables and eggs) not demonstrating significant differences. In addition, owing to the limited data in the original literature, a dose-effect meta-analysis cannot be supported.
- The majority of the included articles were cross-sectional studies, underscoring the necessity for further cohort studies or Mendelian randomization studies to investigate causal relationships and provide additional clinical evidence for the dietary prevention of tinnitus.

Introduction

 Tinnitus, characterized by perceived sounds such as buzzing, cicadas, or electric currents, occurs without external auditory stimuli ¹. It is associated with distress, depression, anxiety, stress, and, in severe cases, suicide,

significantly affecting overall quality of life² ³. Recent epidemiological data suggest a global pooled prevalence of about 14.4% in adults and 13.6% in children and adolescents⁴. The notable prevalence of tinnitus and its substantial impact on life and mental well-being have increasingly become significant medical and societal concerns⁵. The origins of tinnitus remain elusive and involve a range of factors. Some researchers have suggested neural dysfunction or circulatory issues in the inner ear, abnormal neuronal activity in central auditory pathways, and irregular activity in nonauditory brain regions such as the anterior insula, anterior cingulate cortex, and thalamus⁶. In clinical practice, treatments for tinnitus management include psychological counseling, cognitive-behavioral therapy, tinnitus retraining therapy, sound therapy, surgery, pharmacological interventions, and nonpharmacological interventions electrical stimulation, repetitive transcranial magnetic stimulation, nerve block, bimodal neuromodulation, tinnitus retraining therapy, etc.), as well as hearing aids and cochlear implants for patients with relevant hearing loss^{7 8}. Owing to an incomplete understanding of central neuropathological mechanisms, no single treatment universally meets the needs of all patients⁹ 10. Diet can have a significant impact on tinnitus, but it remains uncertain which specific foods worsen or relieve tinnitus symptoms. Diet is an uncertain factor for tinnitus, as mentioned in the James Lind Alliance

 prioritization statement. Optimizing nutritional intake is an essential part of multidimensional efforts to prevent and treat chronic diseases. In recent years, the need for nutritional treatment programs for chronic tinnitus has increased¹¹. A population study investigating the correlation between diet and tinnitus among UK adults revealed a decrease in tinnitus incidence with increased fruit and vegetable consumption. Conversely, avoiding dairy was linked to a greater risk of tinnitus. On the other hand, abstaining from eggs, adding fish to the diet, and consuming caffeinated beverages are suggested to potentially lower the risk of tinnitus ². Another study in British adults revealed that greater fat intake was associated with a greater likelihood of experiencing tinnitus¹². Similarly, Lee and Kim identified risk factors for tinnitus, including low water, protein, riboflavin, and niacin intake, although this was unrelated to fruit and vegetable consumption¹³. It is thought that the intake of high-quality nutrients through food can have a positive effect on the hearing system by improving blood flow to the cochlea, reducing oxidative damage and reducing inflammation. In contrast, high saturated fat intake may increase the risk of tinnitus through cardiovascular pathways¹¹ ¹². Tang et al. ¹⁴ reported that inadequate fruit fiber (<3.6 g/day) and grain fiber (<4.2 g/day) intake were linked to a 65% and 54% increased risk of developing tinnitus over the next decade, respectively. Conflicting results have hindered researchers' ability to understand the potential benefits of diet; hence, a systematic review on the

 relationship between diet and tinnitus is needed.

To date, there has not been a comprehensive examination through systematic reviews or meta-analyses regarding the link between typical dietary patterns and tinnitus. Our objective was to systematically explore this association while accounting for potential confounding variables. This study aimed to provide clinical evidence to inform the development of dietary prevention approaches for tinnitus.

Method

According to the guidelines of the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA), a set of evidence-based standards for the research quality of systematic reviews, which apply to published reviews of literature that contain primary data sources and aim to improve the scientific rigor of systematic reviews¹⁵, the protocol for this study was appropriately registered on PROSPERO under the registration number CRD42023493856. Additionally, our reporting is guided by the Meta-analysis of Observational Studies in Epidemiology (MOOSE) standards for epidemiological observational studies, which were developed by a group of experts to improve the quality and transparency of meta-analysis and systematic evaluation of observational studies, contributing to the scientific validity and credibility of such studies, as referenced ¹⁶. **Supplemental eTable 1** contains the MOOSE listings, whereas

Supplemental 2 outlines the PRISMA instructions.

Search Strategy

 We developed an inclusive search strategy covering diet-related and tinnitus-related subjects to capture pertinent literature from the PubMed. Embase, Web of Science, and Cochrane Library databases. The research design was limited to systematic evaluation. There were no language restrictions imposed on the search, and we considered articles published before May 25, 2024. We used special translation software for publications in unknown languages. The search strategy was designed to identify studies linking tinnitus and diet, and two specific terms, 'Tinnitus' and 'Diet', from the Medical Subject Headings (MeSH) Major Topic were identified. The databases were systematically explored via a blend of MeSH terms, keywords, and various text word variations related to diet, following the guidance outlined by the Scottish Intercollegiate Guidelines Network: ((tinnitus OR Ringing-Buzzing) AND (diet OR food OR water OR milk OR fish OR fruit OR vegetable OR fiber OR sugar OR meat OR margarine OR fat OR egg OR variety OR caffeine OR carbohydrate OR protein). The search strategy for each database is described in Supplemental Search Strategy. The screening process is depicted in Figure 1. The following inclusion criteria were applied: (1) inclusion of cohort, case-control, or cross-sectional studies; (2) inclusion of all individuals in the

study population; (3) consideration of various dietary intakes; and (4) investigation of tinnitus as a study outcome provided effect sizes or other data on the association between dietary intake and tinnitus as an outcome. The exclusion criteria were as follows: (1) studies involving therapeutic interventions; (2) randomized controlled trials, animal experiments, cell studies, case reports, literature, and incomplete or invalid sources, and the original literature lacked sufficient data to calculate the risk ratio for tinnitus (some publications do not report effect sizes but instead allow the raw data to be used to calculate them. In these cases, RevMan (version 5.3) was used to calculate the OR).

Data collection

In **Table 1**, data compilation was conducted by two reviewers (SZ, MZ), including authors' names, participant counts, age spans, survey/diagnosis specifics, and information on food and tinnitus. Given that dietary intake is a continuous variable, some researchers have typically performed stratified comparisons on the basis of regional intake standards and researchers' characteristics. This strategy aimed to explore the impact of varying levels of increased intake on tinnitus incidence. For most continuous variables associated with food intake, adjusted OR values were assimilated in the meta-analysis when stratified according to dose intake, with the exclusion of the reference group. In cases of direct comparison,

Literature quality evaluation

The assessment of individual study quality was conducted by two reviewers (SZ and MZ) via a modified version of the Newcastle-Ottawa Scale. Previous studies were categorized as having a high (<5 stars), moderate (5−7 stars), or low (≥8 stars) risk of bias (see eTable 3 in the Supplement).

Statistical analysis



Table 1: Basic information to be incorporated into the article.

Author	Total	Age	Time frame	Data from	Study design	Diet recording method	Disease diagnosis	Type of diet
Jarach 2023	383	40–65	2016–2019	The Mario Negri Institute in Milan (Italy), Monza e Brianza, Italy	case control	Self-designed questionnaire	Interviewer administered a questionnaire and the Italian-validated version of the tinnitus handicap inventory	coffee, eggs, butter, meat, fish, cheese, fruit, vegetable, varied diet, dairy, milk
Tang 2022	1217	>50	1997 - 2009	Blue Mountains Hearing Study	cohort	Semiquantitative food frequency questionnaire, FFQ	Audiologist administered questionnaire	dietary flavonoids
Tang 2021	1730	>50	1997–2009	Blue Mountains Hearing Study	cohort	Semiquantitative food frequency questionnaire, FFQ	Audiologist administered questionnaire	carbohydrate, sugar, fiber, fruit, vegetable
Dawes 2020	34576	30–69	2006–2010	UK Biobank resource (Collins 2012).	cross-sectional	Dietary assessment was based on the Oxford Web-Q	An epidemiologic method of hearing investigation	fiber, fat, sugar
Lee 2019	3575	40–64	2012–2013	The sixth Korea National Health and Nutrition Examination Survey (KNHANES)	cross-sectional	Food-frequency questionnaire (FFQ)	Self-designed questionnaire	chocolate
Lee 2018	7621	40–80	2013–2015	The sixth Korea National Health and Nutrition Examination Survey (KNHANES)	cross-sectional	Diet was assessed with a semiquantitative food-frequency questionnaire	Self-designed questionnaire	water, protein, fat, carbohydrate, fiber
Lee 2018	13448	>19	2009 - 2012	The sixth Korea National Health and Nutrition Examination Survey	cross-sectional	Food-frequency questionnaire (FFQ)	Self-designed questionnaire	coffee
Spankovich 2017	2176	20–69	1999–2002	NHANES	cross-sectional	Dietary recall interviews were conducted during 1999–2002 NHANES MEC evaluations.	Self-designed questionnaire	fat, fruit, vegetable, meat, varied diet
McCormack 2014	171722	40–69	2006–2010	UK Biobank resource (Collins 2012).	cross-sectional	The UK Biobank touchscreen questionnaire	Self-designed questionnaire	fruit, vegetable, fish, egg, sugar, coffee, dairy
Glicksman 2014	65085	30– 44(regis tered)	1991–2009	The Nurses' Health Study II	cross-sectional	Extensively validated semiquantitative food frequency questionnaires	Self-designed questionnaire	coffee

Data analysis was performed via RevMan (version 5.3) and Stata (version 15.0). Mixed-effect models were utilized to aggregate maximally covariate-adjusted odds ratios (ORs) across all studies. In current practice, odds ratios (ORs), relative risks (RRs), and hazard ratios (HRs) are about equal when events occur infrequently. For this situation, it is acceptable to include OR, RR, and HR in the same meta-analysis. In cases where the P value of the Q test was <0.10 or the I² statistic exceeded 50%, we conducted an assessment to determine significant interstudy heterogeneity. For observational studies, maximally covariate-adjusted estimates were strongly prioritized. If a study employed an analytical method incongruent with synthesis for the majority of other studies, we either converted the effect estimate to the appropriate combined ratio or excluded the study from the meta-analysis. In cases of considerable heterogeneity in the analysis with significant differences, meta-regression was used to explore the source of heterogeneity (please note that meta-regression was considered when the data included in the analysis were greater than 10). We visually assessed the asymmetry of the funnel plot and used Egger's bias to detect possible publication bias, with estimation of missing studies conducted via eMethods if publication bias was suspected (please note that publication bias analysis was considered when the data included in the analysis were

greater than 6). Moreover, we conducted a sensitivity analysis of the pooled results employing a one-by-one exclusion method.

Patient and public involvement

Patients and/or the public were not involved in the design, conduct, reporting, or dissemination plans of this research.

Results

The literature screening process is shown in **Supplemental eTable 4**. Ten articles were found in the search² ¹²⁻¹⁴ ¹⁷⁻²². Among these, two articles delved into individual dietary factors, namely, chocolate ¹⁹ and flavonoids ¹⁸, which were not investigated in other studies. While these two articles were included in the narrative review, they were excluded from the metaanalysis. The remaining eight articles composed the dataset for the metaanalysis. Fifteen common dietary factors were analyzed, and dietary sources were assessed via validated nutrition/diet questionnaires. The combined findings revealed that four diets (caffeine, fruit, dietary fiber, and dairy products) were negatively associated with the incidence of tinnitus; that is, the higher the intake of caffeine, fruit, dietary fiber, and dairy products was, the lower the prevalence of tinnitus.

A meta-analysis of dietary factors

The meta-analysis included eight studies with a total of 301,533 people and analyzed 15 dietary factors, as shown in Figure 2: carbohydrates (2/8, Supplemental eFigure 1), caffeine (4/8, Supplemental eFigure 2), varied diets (2/8, Supplemental eFigure 3), eggs (2/8, Supplemental eFigure 4), fruits (3/9, Supplemental eFigure 5), fibers (2/8, Supplemental eFigure 6), fat (3/8, Supplemental eFigure 7), margarine (2/8, Supplemental eFigure 8), meat (2/8, Supplemental eFigure 9), sugar (4/8, Supplemental eFigure 10), protein (2/8, Supplemental eFigure 11), fish (3/8, Supplemental eFigure 12), vegetables (4/8, Supplemental eFigure 13), water (3/8, Supplemental eFigure 14), and dairy (2/8, Supplemental eFigure 15). The summary results are depicted in Figure 2. The intake of dairy products, fruits, dietary fiber, and caffeine was negatively correlated with the prevalence of tinnitus: 0.827 for dairy [95%] CI 0.766–0.892], $I^2 = 0\%$, p < 0.00001; 0.649 for fruit [95% CI 0.532– 0.793], $I^2 = 0\%$, p < 0.0001; 0.918 for fiber [95% CI 0.851–0.990], $I^2 =$ 63%, p = 0.03; and 0.898 for caffeine [95% CI 0.862–0.935], $I^2 = 23\%$, p < 0.003. Protein intake increased the risk of tinnitus (OR = 1.002 [95% CI 1.001-1.004], $I^2 = 0\%$, p = 0.009). No associations were found between other dietary factors and tinnitus.

248 Sensitivity analysis

 We conducted sensitivity analyses for various dietary intakes on the basis of predefined analysis criteria (requiring data from the included articles to

 exceed 6). Contradictory outcomes were noted in the aggregated results for caffeine (refer to Supplemental eFigure 16), with the analysis attributing these contradictions to data within the same article (Abby McCormack 2014). Sequential exclusion of fruit (refer to Supplemental eFigure 17) and dietary fiber (refer to Supplemental eFigure 18) maintained the statistical significance of the combined odds ratio. Successive exclusion of summary results for vegetables (refer to Supplemental eFigure 19) and sugar (refer to Supplemental eFigure 20) revealed no contradictory outcomes in the combined odds ratio, thus ensuring the robustness of the meta-analysis results. The comprehensive sensitivity analysis revealed the relative robustness of the meta-analysis results, confirming the associations of fruit and dietary fiber intake with the prevalence of tinnitus. No significant associations between other dietary intakes and tinnitus were found.

Publication bias

The funnel plot and Egger test findings for caffeine, fruit, vegetables, diet, sugar, and fat indicated the presence of publication bias (**Supplemental** eFigure 21 – 26). We performed a supplementary analysis using the shear compensation method, which yielded consistent results that suggest that publication bias did not impact the main outcome.

Discussion

 In this systematic review and meta-analysis involving eight observational studies (comprising a total of 301,533 participants), we discovered that increased dietary consumption of fruit, dietary fiber, dairy products, and caffeine was associated with a reduced occurrence of tinnitus. These reductions were 35.1% (20.7%–46.8%) for fruit intake, 9.2% (1%–14.9%) for dietary fiber, 17.3% (10.8%–23.4%) for dairy products, and 10.2% (6.5%–13.8%) for caffeine intake. These results were consistently supported by the sensitivity analysis. The association between caffeine intake and tinnitus remains contentious. Our findings indicate that caffeine has a positive effect on tinnitus incidence. Some suggest that caffeine might effectively decrease tinnitus incidence, possibly because of its anxiety-reducing effects. Conversely, some scholars argue that individuals with tinnitus often experience insomnia, in which caffeine consumption could worsen, thus exacerbating tinnitus symptoms. Recent observational studies ²³ ²⁴ have revealed no link between caffeine consumption and depression or anxiety levels. Furthermore, additional dose analysis revealed a J-pattern association between caffeine intake and psychiatric disorders, with about 2–3 cups per day associated with decreased risk ²⁵. Caffeine, which acts as a nonselective adenosine receptor antagonist, can mitigate anxiety when it is ingested at a daily dose of 10 mg/kg ²⁶. Genetic analysis also suggested a

correlation between caffeine consumption and reduced tinnitus incidence

 27. This effect is achieved through adenosine receptor blockade, dopamine
 release promotion, acetylcholinesterase activity inhibition, and
 sympathetic nerve stimulation.

The results of most studies ¹² ¹⁴ ²¹ ²⁸ showed that dietary fiber and fruit intake have a positive impact on reducing the occurrence of tinnitus, and the findings of our meta-analysis clarify this reliably and comprehensively by integrating and analyzing the results of all relevant studies. Some scholars have proposed that dietary fiber is associated with increased insulin sensitivity²⁹. Studies indicate that hyperinsulinemia resulting from low insulin sensitivity could disturb the inner ear environment, potentially increasing tinnitus risk ³⁰ ³¹. Conversely, research suggests that fiber and dairy products might enhance blood vessel function ³², a factor correlated with tinnitus. Abnormal microcirculation, for example, contributes to a sustained reduction in ear blood flow, potentially leading to cochlear damage and increasing tinnitus risk ¹⁴.

Our combined analysis revealed no correlation between vegetable consumption and tinnitus. Identifying the source of heterogeneity was difficult because of the limited number of articles. Nevertheless, sensitivity analyses reaffirmed the strength of our conclusions. Vegetables and fruits, which are rich in diverse vitamins and minerals crucial for maintaining health, have been shown to improve ear microcirculation, alleviate tinnitus,

and offer additional benefits ¹³ ²⁸. Future studies are expected to provide clearer results.

The body has three main sources of energy: carbohydrates (sugars), fats and proteins. Our findings indicate that protein do not increase the occurrence of tinnitus (OR = 1.002, [95% CI 1.001-1.004], p = 0.009). Protein is a crucial nutrient that requires daily consumption and plays a vital role in supporting neuronal activity and neural development³³ ³⁴. Inadequate protein intake can lead to ototoxic side effects and impair the neural function of the auditory system³⁵. Dawes et al. demonstrated that a higher intake of dietary pattern factor 3 (high protein) was linked to a reduced likelihood of tinnitus¹². Although low-protein diets may affect auditory vestibular function, no studies have specified the necessary amount of protein in the diet. Our analysis revealed links between protein intake and tinnitus risk. Moreover, high-protein diets have been shown to induce oxidative stress in the cerebral cortex and hypothalamus of rats³⁶. Hence, further research on the relationship between protein dosage and tinnitus is warranted in the future. Sugar is an essential daily component, in line with our analysis, no significant effect of sugar intake on tinnitus incidence was observed (OR = 0.997 [95% CI 0.967, 1.027]). High sugar consumption is typically

associated with an unhealthy lifestyle. Proinflammatory foods, including

sugary items, are often associated with increased systemic inflammation

and microvascular damage, particularly microischemic events³⁷. Elevated blood glucose levels can harm small blood vessels and nerves in the inner ear, leading to pathological alterations in outer hair cells and spiral ganglion cells. This can result in nerve tissue ischemia and hypoxia. leading to nerve damage³⁵. Conversely, Spankovich et al. demonstrated that high carbohydrate intake can prevent hearing loss in older adults³⁸. Tang et al. reported a 45% decrease in tinnitus risk for participants in the fourth quartile compared with the first quartile of carbohydrate intake ¹⁴. Both excessive and insufficient dietary intake may have adverse effects on tinnitus, underscoring the need for a dose-response analysis of diet, which would provide valuable insights for preventing dietary tinnitus. Several studies have suggested that increasing the score of healthy foods, such as fruits, vegetables, legumes, nuts, fish, and dairy products, may lower the risk of cardiovascular disease and mortality⁴⁰⁻⁴². Each one-fifth increase in the healthy diet score was associated with a corresponding decrease in overall mortality rate (HR = 0.92; 0.90–0.93), severe cardiovascular disease (HR = 0.94; 95% CI: 0.93-0.95), myocardial infarction (HR = 0.94; 0.92-0.96), stroke (HR = 0.94; 0.89-0.99), and death or cardiovascular disease (HR = 0.93; $0.92-0.94^{43}$). The outcomes of our analysis did not support a notable connection between fat intake and tinnitus risk, although there was a discernible upward trend. Moreover, high-fat diets contribute to obesity and can lead to insulin

 resistance⁴⁴. Conversely, adopting a low-fat/low-cholesterol diet might aid in reducing blood cholesterol and triglyceride levels, potentially alleviating tinnitus symptoms⁴⁵. Future studies are needed to verify the relationship between fat and tinnitus.

A recent study revealed that increased levels of dietary variety, including

quantity, evenness, and quality, were inversely linked to the risk of depressive symptoms, especially among women and older adults⁴⁶. This could offer relief for tinnitus patients. Moreover, dietary variety is believed to be correlated with insulin resistance⁴⁷. Given the protective effects of various diets on human health, further exploration of dietary variety is necessary to validate significant associations. Our pooled analysis indicated that a varied in diet was not significantly linked to a reduced tinnitus incidence (OR = 0.653 [95% CI 0.410, 1.038]) based on the currently available evidence.

We found only one study that investigated the impact of chocolate and flavonoids on the onset of tinnitus ¹⁹, but it did not provide sufficient data for a meta-analysis. Flavonoids, which are abundant in fruits and vegetables, offer antioxidant, anti-inflammatory, and vascular health benefits, which align with the pathophysiology of age-related hearing loss and tinnitus⁴⁸. Additionally, flavonoids interact with signaling cascades involving protein and lipid kinases, inhibiting neuronal death induced by neurotoxicants such as oxygen radicals and promoting neuronal survival

 and synaptic plasticity⁴⁹. Despite the hypothesis that dietary flavonoids might protect against tinnitus development over a 10-year period, Tang et al. ⁴⁸. did not support this idea. However, it is important to note that this study has limitations, such as insufficient data collection.

Chocolate is a globally consumed product renowned for its high phenolic

compound content (flavonoids are a subclass of polyphenols) ⁵⁰. A study by Lee et al. indicated that chocolate consumption is not linked to tinnitus or tinnitus-related issues¹⁹. An animal study demonstrated that polyphenols alleviate oxidative stress in the cochlea by suppressing apoptotic signaling pathways⁵¹. Nonetheless, excessive chocolate consumption can have adverse effects on brain hyperexcitability⁵². Future investigations into the association between chocolate consumption and tinnitus should consider the intake dosage.

This systematic review and meta-analysis represents the first attempt to explore the epidemiological link between diet and tinnitus. While we examined the relationships between fruit, dietary fiber, and caffeine intake and a reduced incidence of tinnitus, it remains inconclusive whether a causal relationship exists.

Conclusion

Diet-based strategies for tinnitus prevention are anticipated to play a significant role in chronic tinnitus management. Existing evidence

suggests that consuming fruit, dietary fiber, caffeine, and dairy may be associated with a reduced incidence of tinnitus. The primary underlying mechanisms may involve the protective effects of these diets on blood vessels and nerves, as well as their anti-inflammatory and antioxidant properties. However, it is crucial to interpret our findings cautiously because of the overall low quality of the evidence available. In the future, further well-designed, large-scale, cross-population cohort studies are warranted to complement and verify the relationship between dietary intake and tinnitus. Additionally, focusing on the dosage and categorization of each dietary intake would provide valuable insights.

Author Contribution

All authors contributed to the study's conception and design. SZ, MZ, XW,
YJ conducted data collection and analysis. SZ, QZ designed the test plan.
QF as the paper guide, control the quality of the paper, XH, XL, XW, HW
drew the chart. XC, LW, LF completed the writing of the test plan. XL and
QZ revised the manuscript. QZ is responsible for the overall content as the

Author Declaration

guarantor.

The author has no direct conflict of interest.

Ethical Approval

The article belongs to the review category and does not require the

approval of the ethics committee.

Funding

- This work was supported by the National Natural Science Foundation of
- China (No. 81774131, 82174198), 'Xinglin Scholars Scientific Research
- 433 Promotion Plan of Chengdu University of Traditional Chinese Medicine
- 434 Innovation team of traditional Chinese medicine otorhinolaryngology
- discipline, natural science (No. XKTD2021003), the Sichuan Natural
- 436 Science Foundation (No. 2023NSFSC0668).

Data availability statement

- The data used to support the findings of this study are available from the
- corresponding author upon request.

Reference

- 1. Mazurek B, Hesse G, Sattel H, et al. S3 Guideline: Chronic Tinnitus : German Society for
- Otorhinolaryngology, Head and Neck Surgery e. V. (DGHNO-KHC). *Hno* 2022;70(11):795-827.
- 445 doi: 10.1007/s00106-022-01207-4 [published Online First: 2022/10/14]
- 2. McCormack A, Edmondson-Jones M, Mellor D, et al. Association of dietary factors with
- 447 presence and severity of tinnitus in a middle-aged UK population. PLoS One

- 448 2014;9(12):e114711. doi: 10.1371/journal.pone.0114711 [published Online First: 2014/12/17]
- 3. MacDonald C, Caimino C, Burns-O'Connell G, et al. Tinnitus, Suicide, and Suicidal Ideation:
- 450 A Scoping Review of Primary Research. *Brain Sci* 2023;13(10) doi: 10.3390/brainsci13101496
- 451 [published Online First: 2023/10/28]

- 452 4. Jarach CM, Lugo A, Scala M, et al. Global Prevalence and Incidence of Tinnitus: A
- 453 Systematic Review and Meta-analysis. JAMA Neurol 2022;79(9):888-900. doi:
- 454 10.1001/jamaneurol.2022.2189 [published Online First: 2022/08/09]
- 5. Zhou F, Zhang T, Jin Y, et al. Worldwide Tinnitus Research: A Bibliometric Analysis of the
- 456 Published Literature Between 2001 and 2020. Front Neurol 2022;13:828299. doi:
- 457 10.3389/fneur.2022.828299 [published Online First: 2022/02/18]
- 458 6. Langguth B, Kreuzer PM, Kleinjung T, et al. Tinnitus: causes and clinical management.
- 459 Lancet Neurol 2013;12(9):920-30. doi: 10.1016/s1474-4422(13)70160-1 [published Online
- 460 First: 2013/08/21]
- 7. Kleinjung T, Peter N, Schecklmann M, et al. The Current State of Tinnitus Diagnosis and
- Treatment: a Multidisciplinary Expert Perspective. J Assoc Res Otolaryngol 2024;25(5):413-25.
- doi: 10.1007/s10162-024-00960-3 [published Online First: 2024/08/14]
- 464 8. Park KW, Kullar P, Malhotra C, et al. Current and Emerging Therapies for Chronic Subjective
- 465 Tinnitus. J Clin Med 2023;12(20) doi: 10.3390/jcm12206555 [published Online First:
- 466 2023/10/28]
- 467 9. Sereda M, Xia J, El Refaie A, et al. Sound therapy (using amplification devices and/or sound
- 468 generators) for tinnitus. Cochrane Database Syst Rev 2018;12(12):Cd013094. doi:
- 469 10.1002/14651858.CD013094.pub2 [published Online First: 2018/12/28]

- 470 10. Lewis S, Chowdhury E, Stockdale D, et al. Assessment and management of tinnitus:
- 471 summary of NICE guidance. Bmj 2020;368:m976. doi: 10.1136/bmj.m976 [published Online
- 472 First: 2020/04/03]
- 473 11. Marcrum SC, Engelke M, Goedhart H, et al. The Influence of Diet on Tinnitus Severity:
- 474 Results of a Large-Scale, Online Survey. *Nutrients* 2022;14(24) doi: 10.3390/nu14245356
- 475 [published Online First: 2022/12/24]
- 476 12. Dawes P, Cruickshanks KJ, Marsden A, et al. Relationship Between Diet, Tinnitus, and
- 477 Hearing Difficulties. *Ear Hear* 2020;41(2):289-99. doi: 10.1097/aud.0000000000000065
- 478 [published Online First: 2019/07/30]
- 479 13. Lee DY, Kim YH. Relationship Between Diet and Tinnitus: Korea National Health and
- 480 Nutrition Examination Survey. Clin Exp Otorhinolaryngol 2018;11(3):158-65. doi
- 481 10.21053/ceo.2017.01221 [published Online First: 2018/02/13]
- 482 14. Tang D, Tran Y, Shekhawat GS, et al. Dietary Fibre Intake and the 10-Year Incidence of
- Tinnitus in Older Adults. Nutrients 2021;13(11) doi: 10.3390/nu13114126 [published Online
- 484 First: 2021/11/28]
- 485 15. Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated
- 486 guideline for reporting systematic reviews. *Bmj* 2021;372:n71. doi: 10.1136/bmj.n71 [published
- 487 Online First: 2021/03/31]
- 488 16. Stroup DF, Berlin JA, Morton SC, et al. Meta-analysis of observational studies in
- 489 epidemiology: a proposal for reporting. Meta-analysis Of Observational Studies in
- 490 Epidemiology (MOOSE) group. *Jama* 2000;283(15):2008-12. doi: 10.1001/jama.283.15.2008
- 491 [published Online First: 2000/05/02]

- 492 17. Jarach CM, Lugo A, Garavello W, et al. The Role of Diet in Tinnitus Onset: A Hospital-
- 493 Based Case-Control Study from Italy. Nutrients 2023;15(3) doi: 10.3390/nu15030621
- 494 [published Online First: 2023/02/12]

- 18. Tang D, Tran Y, Lewis JR, et al. Associations between intake of dietary flavonoids and the
- 496 10-year incidence of tinnitus in older adults. *Eur J Nutr* 2022;61(4):1957-64. doi:
- 497 10.1007/s00394-021-02784-w [published Online First: 2022/01/25]
- 498 19. Lee SY, Jung G, Jang MJ, et al. Association of Chocolate Consumption with Hearing Loss
- 499 and Tinnitus in Middle-Aged People Based on the Korean National Health and Nutrition
- 500 Examination Survey 2012⁻2013. *Nutrients* 2019;11(4) doi: 10.3390/nu11040746 [published
- 501 Online First: 2019/04/03]
- 502 20. Lee SY, Jung G, Jang MJ, et al. Association of Coffee Consumption with Hearing and
- 503 Tinnitus Based on a National Population-Based Survey. *Nutrients* 2018;10(10) doi:
- 504 10.3390/nu10101429 [published Online First: 2018/10/06]
- 21. Spankovich C, Bishop C, Johnson MF, et al. Relationship between dietary quality, tinnitus
- and hearing level: data from the national health and nutrition examination survey, 1999-2002.
- *Int J Audiol* 2017;56(10):716-22. doi: 10.1080/14992027.2017.1331049 [published Online First:
- 508 2017/05/30]
- 509 22. Glicksman JT, Curhan SG, Curhan GC. A prospective study of caffeine intake and risk of
- 510 incident tinnitus. *Am J Med* 2014;127(8):739-43. doi: 10.1016/j.amjmed.2014.02.033 [published
- 511 Online First: 2014/03/13]
- 512 23. Castro A, Gili M, Visser M, et al. Soft Drinks and Symptoms of Depression and Anxiety in
- 513 Overweight Subjects: A Longitudinal Analysis of an European Cohort. *Nutrients* 2023;15(18)

- 514 doi: 10.3390/nu15183865 [published Online First: 2023/09/28]
- 515 24. Makki NM, Alharbi ST, Alharbi AM, et al. Caffeine Consumption and Depression, Anxiety,
- 516 and Stress Levels Among University Students in Medina: A Cross-Sectional Study. Cureus
- 517 2023;15(10):e48018. doi: 10.7759/cureus.48018 [published Online First: 2023/11/02]
- 518 25. Min J, Cao Z, Cui L, et al. The association between coffee consumption and risk of incident
- 519 depression and anxiety: Exploring the benefits of moderate intake. Psychiatry Res
- 520 2023;326:115307. doi: 10.1016/j.psychres.2023.115307 [published Online First: 2023/06/23]
- 521 26. Imam-Fulani A, Owoyele BV. Effect Of Caffeine and Adrenaline on Memory and Anxiety in
- 522 Male Wistar Rats. *Niger J Physiol Sci* 2022;37(1):69-76. doi: 10.54548/njps.v37i1.9 [published
- 523 Online First: 2022/08/11]
- 524 27. Cresswell M, Casanova F, Beaumont RN, et al. Understanding Factors That Cause Tinnitus:
- A Mendelian Randomization Study in the UK Biobank. Ear Hear 2022;43(1):70-80. doi:
- 526 10.1097/aud.000000000001074 [published Online First: 2021/06/11]
- 527 28. Tomanic M, Belojevic G, Jovanovic A, et al. Dietary Factors and Tinnitus among
- 528 Adolescents. Nutrients 2020;12(11) doi: 10.3390/nu12113291 [published Online First:
- 529 2020/10/31]
- 29. Barber TM, Kabisch S, Pfeiffer AFH, et al. The Health Benefits of Dietary Fibre. *Nutrients*
- 531 2020;12(10) doi: 10.3390/nu12103209 [published Online First: 2020/10/25]
- 532 30. Mangabeira Albernaz PL, Fukuda Y. Glucose, insulin and inner ear pathology. Acta
- 533 Otolaryngol 1984;97(5-6):496-501. doi: 10.3109/00016488409132927 [published Online First:
- 534 1984/05/01]
- 535 31. Borghi C, Cosentino ER, Rinaldi ER, et al. Tinnitus in elderly patients and prognosis of mild-

536	to-moderate congestive heart failure: a cross-sectional study with a long-term extension of the
537	clinical follow-up. <i>BMC Med</i> 2011;9:80. doi: 10.1186/1741-7015-9-80 [published Online First:
538	2011/06/30]
539	32. Jeong Y, Lee KW, Kim H, et al. Association of milk and dairy product consumption with the
540	incidence of cardio-cerebrovascular disease incidence in middle-aged and older Korean adults:
541	a 16-year follow-up of the Korean Genome and Epidemiology Study. Nutr Res Pract
542	2023;17(6):1225-37. doi: 10.4162/nrp.2023.17.6.1225 [published Online First: 2023/12/06]
543	33. Cui F, Li H, Cao Y, et al. The Association between Dietary Protein Intake and Sources and
544	the Rate of Longitudinal Changes in Brain Structure. <i>Nutrients</i> 2024;16(9) doi:
545	10.3390/nu16091284 [published Online First: 2024/05/11]
546	34. Abey NO, Ebuehi OAT, Imaga NOA. Neurodevelopment and Cognitive Impairment in
547	Parents and Progeny of Perinatal Dietary Protein Deficiency Models. Front Neurosci
548	2019;13:826. doi: 10.3389/fnins.2019.00826 [published Online First: 2019/09/26]
549	35. Chen HL, Tan CT, Wu CC, et al. Effects of Diet and Lifestyle on Audio-Vestibular
550	Dysfunction in the Elderly: A Literature Review. <i>Nutrients</i> 2022;14(22) doi:
551	10.3390/nu14224720 [published Online First: 2022/11/27]
552	36. Żebrowska E, Maciejczyk M, Żendzian-Piotrowska M, et al. High Protein Diet Induces
553	Oxidative Stress in Rat Cerebral Cortex and Hypothalamus. <i>Int J Mol Sci</i> 2019;20(7) doi:
554	10.3390/ijms20071547 [published Online First: 2019/03/31]
555	37. Sardone R, Lampignano L, Guerra V, et al. Relationship between Inflammatory Food
556	Consumption and Age-Related Hearing Loss in a Prospective Observational Cohort: Results
557	from the Salus in Anulia Study. <i>Nutrients</i> 2020:12(2) doi: 10.3390/nu12020426 [nublished

- 558 Online First: 2020/02/13]
- 38. Spankovich C, Hood LJ, Silver HJ, et al. Associations between diet and both high and low
- 560 pure tone averages and transient evoked otoacoustic emissions in an older adult population-
- 561 based study. J Am Acad Audiol 2011;22(1):49-58. doi: 10.3766/jaaa.22.1.6 [published Online
- 562 First: 2011/03/23]
- 39. Yang X, Lin C, Wu Q, et al. Low-sodium diet with adequate water intake improved the
- 564 clinical efficacy in Ménière's disease. *Acta Otolaryngol* 2024;144(1):14-18. doi:
- 565 10.1080/00016489.2024.2315302 [published Online First: 2024/02/20]
- 566 40. Ocagli H, Berti G, Rango D, et al. Association of Vegetarian and Vegan Diets with
- 567 Cardiovascular Health: An Umbrella Review of Meta-Analysis of Observational Studies and
- Randomized Trials. *Nutrients* 2023;15(19) doi: 10.3390/nu15194103 [published Online First:
- 569 2023/10/14]
- 570 41. Tan L, Stagg L, Hanlon E, et al. Associations between Vegetable Nitrate Intake and
- 571 Cardiovascular Disease Risk and Mortality: A Systematic Review. *Nutrients* 2024;16(10) doi:
- 572 10.3390/nu16101511 [published Online First: 2024/05/25]
- 573 42. Doundoulakis I, Farmakis IT, Theodoridis X, et al. Effects of dietary interventions on
- 574 cardiovascular outcomes: a network meta-analysis. *Nutr Rev* 2024;82(6):715-25. doi:
- 575 10.1093/nutrit/nuad080 [published Online First: 2023/07/11]
- 576 43. Mente A, Dehghan M, Rangarajan S, et al. Diet, cardiovascular disease, and mortality in
- 577 80 countries. Eur Heart J 2023;44(28):2560-79. doi: 10.1093/eurheartj/ehad269 [published
- 578 Online First: 2023/07/07]
- 579 44. Tsai SF, Wu HT, Chen PC, et al. High-fat diet suppresses the astrocytic process

- arborization and downregulates the glial glutamate transporters in the hippocampus of mice.
- 581 Brain Res 2018;1700:66-77. doi: 10.1016/j.brainres.2018.07.017 [published Online First:
- 582 2018/07/17]

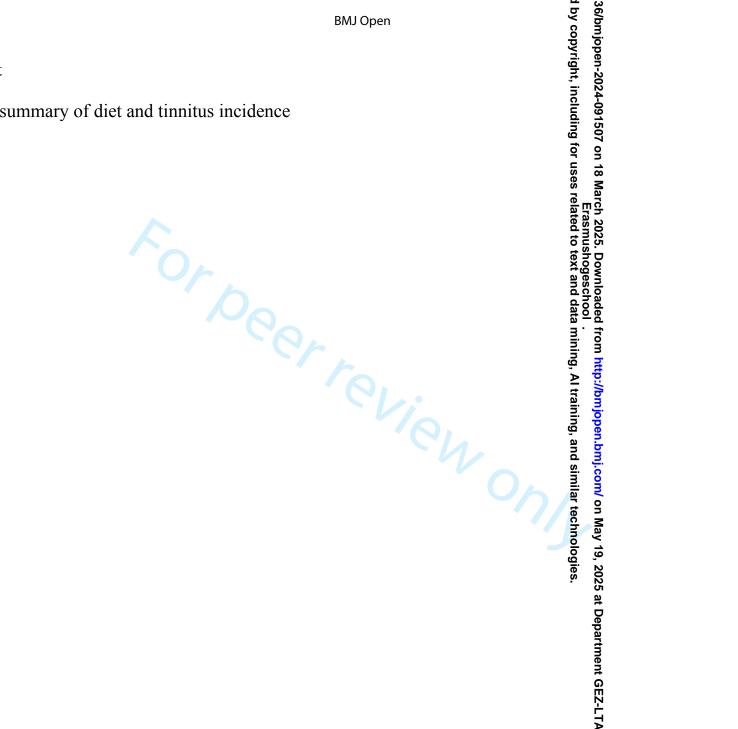
- 45. Musleh A, Alshehri S, Qobty A. Hyperlipidemia and its relation with tinnitus: Cross-sectional
- 584 approach. *Niger J Clin Pract* 2022;25(7):1046-49. doi: 10.4103/njcp.njcp_1465_21 [published
- 585 Online First: 2022/07/22]
- 46. Li Z, Li PW, Zhang D. Association between all aspects of dietary diversity and risk of
- 587 depressive symptoms in US adults. Food Funct 2023;14(20):9204-11. doi
- 588 10.1039/d3fo00642e [published Online First: 2023/10/04]
- 589 47. Mozaffari H, Hosseini Z, Lafrenière J, et al. The role of dietary diversity in preventing
- 590 metabolic-related outcomes: Findings from a systematic review. *Obes Rev* 2021;22(6):e13174.
- 591 doi: 10.1111/obr.13174 [published Online First: 2021/02/23]
- 592 48. Tang D, Tran Y, Shekhawat GS, et al. Dietary Flavonoid Intake and Chronic Sensory
- Conditions: A Scoping Review. *Antioxidants (Basel)* 2022;11(7) doi: 10.3390/antiox11071214
- 594 [published Online First: 2022/07/28]
- 595 49. Nehlig A. The neuroprotective effects of cocoa flavanol and its influence on cognitive
- 596 performance. *Br J Clin Pharmacol* 2013;75(3):716-27. doi: 10.1111/j.1365-2125.2012.04378.x
- 597 [published Online First: 2012/07/11]
- 598 50. da Silva Medeiros N, Koslowsky Marder R, Farias Wohlenberg M, et al. Total Phenolic
- 599 Content and Antioxidant Activity of Different Types of Chocolate, Milk, Semisweet, Dark, and
- 600 Soy, in Cerebral Cortex, Hippocampus, and Cerebellum of Wistar Rats. Biochem Res Int
- 601 2015;2015:294659. doi: 10.1155/2015/294659 [published Online First: 2015/12/10]

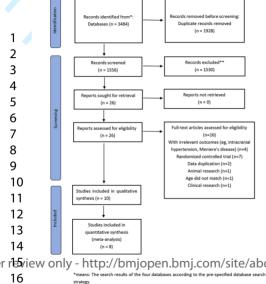
602	51. Sánchez-Rodríguez C, Cuadrado E, Ri
603	age-associated apoptosis in female rat co
604	10.1007/s10522-018-9747-7 [published Onli
605	52. Cicvaric A, Bulat T, Bormann D, et a
606	chocolate enhances seizure-like events
607	2018;9(3):1532-44. doi: 10.1039/c7fo01668a
608	
609	
610	
611	

51. Sánchez-Rodríguez C, Cuadrado E, Riestra-Ayora J, et al. Polyphenols protect against
age-associated apoptosis in female rat cochleae. <i>Biogerontology</i> 2018;19(2):159-69. doi:
10.1007/s10522-018-9747-7 [published Online First: 2018/01/25]
52. Cicvaric A, Bulat T, Bormann D, et al. Sustained consumption of cocoa-based dark
chocolate enhances seizure-like events in the mouse hippocampus. Food Funct
2018;9(3):1532-44. doi: 10.1039/c7fo01668a [published Online First: 2018/02/13]

Figure 1: Flow chart

Figure 2: Risk ratio summary of diet and tinnitus incidence



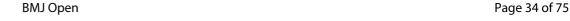


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18	Caffeine	3	23.0%	0.898	0.862	0.935					-			-20 ht,		Low	Class II
19	Varied diet	2	50.0%	0.653	0.410	1.038		-				+		en-2024-091507 right, including		Very low	NS
20	Egg	2	55.0%	1.010	0.880	1.160						•		<u>ii</u> 69		Very low	NS
21	Fruit	3	0.0%	0.649	0.532	0.793								15(din		Moderate	Class II
22	Fiber	3	63.0%	0.918	0.851	0.990					-8	_		9 f		Low	Class II
23	Fat	3	73.0%	1.072	0.973	1.181						+		for		Very low	NS
24	Margarine	2	0.0%	1.208	0.900	1.622						_		[8		Low	NS
25	Meat	2	0.0%	1.099	0.783	1.542				_				¥ ≤		Low	NS
26	Protein	2	0.0%	1.002	1.001	1.004						•		<u>е</u> п <u>с</u>		Low	Class III
27	Sugar	3	0.0%	0.997	0.967	1.027						#		າ 20 ras itec		Low	NS
28	Fish	3	72.0%	0.979	0.907	1.056					_	-		t 25		Very low	NS
29	Vegetable	4	0.0%	1.101	0.907	1.337					_		_	ish te		Very low	NS
30	Water	3	0.0%	1.003	0.992	1.014						•		ž o o		Low	NS
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The blue or red dots represent OR values, and the black linesrepresent confidence intervals The blue or red dots represent OR values, and the black linesrepresent confidence intervals

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36p<0.05 indicates statistical difference.

37The evidence classification criteria: Class I (convincing evidence), Class II (highly suggestive evidence), Class III (suggestive evidence), Class IV

³⁸(weak evidence), and NS (non-significant). training, and similar technologies.

³⁹₄₀GRADE:Grade of Recommendations Assessment, Development, and Evaluation.

41 Moderate: The results of current efficacy evaluation are likely to be close to the true value;

42Low: The reliability of the current efficacy evaluation results is uncertain;

⁴³Very low: The reliability of the current efficacy evaluation results is very uncertain;

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We used mixed-effects models to pool maximally covariate-adjusted odds ratios (ORs) from each study. Due to the low incidence of events and short follow-up events, OR, RR, and inter-study heterogeneity to be significant. For observational studies, we maximally support covariate-adjusted estimates. If a tues uses an analytical method that is incompatible with synthesis for most other studies, we convert the effect estimate to the appropriate combined ratio or exclude the study from the recta-analysis.

Stata analysis

Publication bias

If the article heterogeneity is large in the analysis with statistical differences, we will use meta regression to investigate the source of the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with the funne

Analysis software	e						nd dat	าloaded school	
We conducted all analy significant.	rses using stata (v	ersion 16) a	and Revie	w Manager (vers	ion 5.3).	Unless otherwise spec	ified, we commi	de red a two-sided	P value of <0.05 as statisti
eFigure 1: Forest							, Al training,	http://bm jopen yelght apportioned	to studies in the meta- analy
Carbohydrate: OR=1.00	, [95%CI 1.00,1.0	0], I ² =33%, ₁	p=0.05.				dsim	nj. cor	
				Odds Ratio		Odds Ratio	iii ar	ال (
Study or Subgroup	log[Odds Ratio]	SE	Weight	IV, Fixed, 95% CI		IV, Fixed, 95%		<u> </u>	
Diana Tang 2021a	-0.3011051	0.2326598	0.0%	0.74 [0.47, 1.17]			앍	May	
Diana Tang 2021b	-0.3024573	0.2282614	0.0%	0.74 [0.47, 1.16]	•				
Diana Tang 2021c	-0.597837	0.2483288	0.0%	0.55 [0.34, 0.89]	•	- 8	logie	9,	
Doh Young Lee 2018	0.0009995	0.0005102	100.0%	1.00 [1.00, 1.00]			es	2025	
Piers Dawes 2020a	0.0295588	0.0492101	0.0%	1.03 [0.94, 1.13]		35 3	75		
Piers Dawes 2020b	-0.0202027	0.059233	0.0%	0.98 [0.87, 1.10]	88	65 - 23		at [
Piers Dawes 2020c	-0.0100503	0.0719008	0.0%	0.99 [0.86, 1.14]	- 33	9359		Эер	
Piers Dawes 2020d	-0.0725707	0.0876968	0.0%	0.93 [0.78, 1.10]	•	3		Department	
Total (95% CI)			100.0%	1.00 [1.00, 1.00]				nent	
Heterogeneity: Chi2 = 1	0.46, $df = 7$ ($P = 0.1$	6); I ² = 33%			0.05	0.9	11	- 유 -	
Test for overall effect: Z		373 313			0.85 Favo	urs [experimental] Favo	urs [control]	GEZ-LTA	

Study	ES	[95% Conf. I	nterval]	% Weight
Diana Tang 2021a	0.740	0.469	1.168	0.00
Diana Tang 2021b	0.739	0.472	1.156	0.00
Diana Tang 2021c	0.550	0.338	0.895	0.00
Doh Young Lee 2018	1.001	1.000	1.002	99.97
Piers Dawes 2020a	1.030	0.935	1.134	0.01
Piers Dawes 2020b	0.980	0.873	1.101	0.01
Piers Dawes 2020c	0.990	0.860	1.140	0.01
Piers Dawes 2020d	0.930	0.783	1.104	0.00
T-V pooled FS	1.001	1.000	1.002	100.00

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Micaela Jarach 2023a	Carlotta Micaela Jarach 2023a
Micaela Jarach 2023b	Carlotta Micaela Jarach 2023b
Micaela Jarach 2023b -0.3710637	Carlotta Micaela Jarach 2023b
Glicksman 2014b -0.0943106 0.0393242 28.0% 0.91 [0.84, 0.98]	Jordan T Glicksman 2014b
Glicksman 2014b -0.0943106 0.0393242 28.0% 0.91 [0.84, 0.98]	Jordan T Glicksman 2014b
Glicksman 2014c -0.1625189 0.0569244 13.4% 0.85 [0.76, 0.95]	Jordan T Glicksman 2014c -0.1625189 0.0569244 13.4% 0.85 [0.76, 0.95]
Telicksman 2014d -0.2357223 0.0743244 7.8% 0.79 [0.68, 0.91] و الله الله الله الله الله الله الله ال	Sang-Youp Lee 2018c -0.0512933 0.1386774 2.3% 0.95 [0.72, 1.25]
up Lee 2018 -0.2231435 0.1178662 3.1% 0.80 [0.63, 1.01]	Sang-Youp Lee 2018c -0.0512933 0.1386774 2.3% 0.95 [0.72, 1.25]
up Lee 2018b -0.1053605 0.1045972 4.0% 0.90 [0.73, 1.10]	Sang-Youp Lee 2018c -0.0512933 0.1386774 2.3% 0.95 [0.72, 1.25]
up Lee 2018c -0.0512933 0.1386774 2.3% 0.95 [0.72, 1.25] · · · · · · · · · · · · · · · · · · ·	
99 99 99	Total (05% CI)
% CI)	100.0% 0.30 [0.66, 0.34]
ANT CHANGE OF CASE OF	Heterogeneity: Chi² = 10.43, df = 8 (P = 0.24); l² = 23% 0.7
	00.0% 0.90 [0.80, 0.94]

Study	ES	[95% Conf.	Interval]	% Weight
 Carlotta Micaela Jar	0.490	0.241	0.995	0.33
Carlotta Micaela Jar	0.690	0.336	1.415	0.32
Jordan T 2014a	0.940	0.882	1.002	40.76
Jordan T 2014b	0.910	0.842	0.983	28.03
Jordan T 2014c	0.850	0.760	0.950	13.38
Jordan T 2014d	0.790	0.683	0.914	7.85
Sang-Youp Lee 2018	0.800	0.635	1.008	3.12
Sang-Youp Lee 2018	0.900	0.733	1.105	3.96
Sang-Youp Lee 2018	0.950	0.724	1.247	2.25
I-V pooled ES	0.898	0.862	0.935	100.00

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Study	ES	[95% Conf.	. Interval]	% Weight	· •
Carlotta Micaela Jar	0.490	0.241	0.995	0.33	24-091507 including
Carlotta Micaela Jar	0.690	0.336	1.415	0.32	
Jordan T 2014a	0.940	0.882	1.002	40.76	
Jordan T 2014b	0.910	0.842	0.983	28.03	use
Jordan T 2014c	0.850	0.760	0.950	13.38	s Mai
Jordan T 2014d	0.790	0.683	0.914	7.85	ea mc
Sang-Youp Lee 2018	0.800	0.635	1.008	3.12	as: ted
Sang-Youp Lee 2018	0.900	0.733	1.105	3.96	
Sang-Youp Lee 2018	0.950	0.724	1.247	2.25	text
I-V pooled ES	0.898	0.862	0.935	100.00	March 2025. Downloaded Erasmushogeschool es related to text and data
	+				 hool data
Actually: Caffeine: OR=0.8	98, [95%CI	0.862,0.935]			
					<u> i</u> on
E' 2 E 4 D	4 61	• 41 A	• 4•	D 4 1.	·, 1,· ·, gg =
eFigure 3: Forest P	lot Show	ing the Ass	sociation	Between divers	ity and tinnitus.
eFigure 3: Forest Pl	lot Show	ing the Ass	sociation	Between divers	311 V 34 M A 1 1 M M H H H S
J					tra
J	mated poole	ed odd ratio (O	R) for each ra		nalysis; Red box sizes reflect the relative weight apportioned to studies in the meta- and
Black diamonds are the esti	mated poole	ed odd ratio (O	R) for each ra	ndom-effects meta-a	nalysis; Red box sizes reflect the relative weight apportioned to studies in the meta- and
Black diamonds are the esti	mated poole CI 0.41,1.04	ed odd ratio (O	R) for each ra		nalysis; Red box sizes reflect the relative weight apportioned to studies in the meta- and one of the control o
Black diamonds are the esti Diversity: OR=0.65, [95%C	mated poole CI 0.41,1.04	ed odd ratio (Ol], I ² =50% p=0.0	R) for each ra 08.	ndom-effects meta-a	nalysis; Red box sizes reflect the relative weight apportioned to studies in the meta- and one of the control o
Black diamonds are the esti Diversity: OR=0.65, [95%C	mated poole CI 0.41,1.04 log[0 23a	ed odd ratio (Ol], I ² =50% p=0.0	R) for each ra 08. SE We 3247361 29	ndom-effects meta-a Odds Ratio ight IV, Random, 95	Odds Ratio and box sizes reflect the relative we have a portioned to studies in the meta- and the studies in the studies in the meta- and the studies in the
Black diamonds are the esti Diversity: OR=0.65, [95%C Study or Subgroup Carlotta Micaela Jarach 20 Carlotta Micaela Jarach 20	mated poole CI 0.41,1.04 log[0 23a 23b	ed odd ratio (Ol], I ² =50% p=0.0 Odds Ratio] -0.6348783 0.	R) for each ra 08. SE We 3247361 29 3371826 28	ndom-effects meta-a Odds Ratio ight IV, Random, 95 0.53 [0.28,	Odds Ratio N, Random, 95% (1) Odds Ratio Odds Rat
Black diamonds are the esti Diversity: OR=0.65, [95%C Study or Subgroup Carlotta Micaela Jarach 20	mated poole CI 0.41,1.04 log[0 23a 23b	ed odd ratio (Ol], I ² =50% p=0.0 Odds Ratio] -0.6348783 0. -0.7550226 0.	R) for each ra 08. SE We 3247361 29 3371826 28 0.2295 41	Odds Ratio ight IV, Random, 95 0.7% 0.47 [0.24, 0.48] 0.96 [0.61, 1	Odds Ratio N, Random, 95% (1) Odds Ratio Odds Rat
Black diamonds are the esti Diversity: OR=0.65, [95%C Study or Subgroup Carlotta Micaela Jarach 20 Carlotta Micaela Jarach 20	mated poole CI 0.41,1.04 log[0 23a 23b	ed odd ratio (Ol], I ² =50% p=0.0 Odds Ratio] -0.6348783 0. -0.7550226 0.	R) for each ra 08. SE We 3247361 29 3371826 28 0.2295 41	Odds Ratio ight IV, Random, 95 0.9% 0.53 [0.28, 1 0.47 [0.24, 1	Odds Ratio N, Random, 95% on May Odds Ratio
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Black diamonds are the esti Diversity: OR=0.65, [95%C Study or Subgroup Carlotta Micaela Jarach 20 Carlotta Micaela Jarach 20 Christopher Spankovich 20 Total (95% CI) Heterogeneity: Tau ² = 0.09	mated poole CI 0.41,1.04 log[0 23a 23b 017	ed odd ratio (Ol], I ² =50% p=0.0 Odds Ratio] -0.6348783 0.1 -0.7550226 0.1 -0.0444 , df= 2 (P = 0.14	R) for each ra 08. SE We 3247361 29 3371826 28 0.2295 41	Odds Ratio ight IV, Random, 95 0.7% 0.47 [0.24, 0.48] 0.96 [0.61, 1	Odds Ratio
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Black diamonds are the esti Diversity: OR=0.65, [95%C Study or Subgroup Carlotta Micaela Jarach 20 Carlotta Micaela Jarach 20 Christopher Spankovich 20 Total (95% CI) Heterogeneity: Tau ² = 0.09	mated poole CI 0.41,1.04 log[0 23a 23b 017	ed odd ratio (Ol], I ² =50% p=0.0 Odds Ratio] -0.6348783 0.1 -0.7550226 0.1 -0.0444 , df= 2 (P = 0.14	R) for each ra 08. SE We 3247361 29 3371826 28 0.2295 41	Odds Ratio ight IV, Random, 95 0.53 [0.28, 0.47] 0.7% 0.47 [0.24, 0.48] 0.96 [0.61, 0.96]	nalysis; Red box sizes reflect the relative weight apportioned to studies in the meta- and odds Ratio odds Rat

Study	ES	[95% Conf.	Interval]	% Weight
+ Carlotta Micaela Jar	0.530	0.280	1.002	29.86
Carlotta Micaela Jar	0.470	0.243	0.910	28.60
Christopher Spankovi	0.950	0.606	1.490	41.54
D+L pooled ES	0.653	0.410	1.038	100.00

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Study	ES	[95% Co	onf.	Interval]	% Weight)24-091507
Carlotta Micaela Ja	r 0.530	0.28	80	1.002	29.86	for on
Carlotta Micaela Ja	r 0.470	0.24	13	0.910	28.60	u 18
Christopher Spankov	i 0.950	0.60	96	1.490	41.54	Marc Feb
D+L pooled ES	0.653	0.41	10	1.038	100.00	18 March 2025. Downloaded Erasmushogeschool uses related to text and data
Actually: diversity: OR=0.653,	[95%CI 0.410, 1.03	8].				. Dow
5						and
6						hade da
⁷ eFigure 4: Forest Plot	Showing the	Association	n Ret	ween eoo and t	innitus	ta · · · · · · · · · · · · · · · · · · ·
8	Showing the 1	1550014110	пъсс	ween egg and t	iiiiitus.	ni n
9 Rlack diamonds are the estimate	ed pooled odd ratio	(OR) for each	randon	n-effects meta-analys	sis: Red boy size	s reflect the relative weight apportioned to studies in the meta-analysis
Black diamonds are the estimate Egg: OR=1.02, [95%CI 0.91,1.			ranuon	ii-criccis ilicia-aliarys	sis, Red box size:	
22	- J ,			Odds Ratio		Odds Ratio train p IV, Random, 95% 51 9
Study or Subgroup	log[Odds Ratio]	SE I	Weight	IV, Random, 95% CI		Odds Ratio (1) 10 10 10 10 10 10 10 10 10 10 10 10 10
4 Abby McCormack 2014a	0.0304592		43.4%	1.03 [0.98, 1.09]		
5 Abby McCormack 2014b			32.9%			and bm
6 Abby McCormack 2014c			17.3%	0.90 [0.72, 1.13]		j.com/ c
7 Carlotta Micaela Jarach 2023a		0.338181	3.0%	0.99 [0.51, 1.92]		ii ž
8 Carlotta Micaela Jarach 2023b	-0.6161861	0.3157843	3.4%	0.54 [0.29, 1.00]		
9 O Total (95% CI)		9	100.0%	1.02 [0.91, 1.15]		on May- techno
Heterogeneity: Tau ^z = 0.01; Ch	i²= 8 83 df= 4 (P=)			1.02 [0.5 1, 1.15]	F +	
riciciogeneity, rau = 0.01, Ci	10 - 0.03, $ui - 4 (i - 1)$	3.077, 1 - 33.70			0.01 0.1	1 © . 90 100
Test for overall effect: $7 = 0.32$	(P = 0.75)					
	(P = 0.75)				Favours [exp	
	(P = 0.75)				Favours [exp	perimental] Favour (can captrol)
} 	(P = 0.75)				Favours [exp	perimental] Favour (can captrol)
} 	(P = 0.75)				Favours [exp	perimental] Favour (can captrol)
3 1 5	(P = 0.75)				Favours [exp	perimental] Favour (can captrol)
Test for overall effect: Z = 0.32 Test for overall effect: Z = 0.32 Test for overall effect: Z = 0.32	(P = 0.75)				Favours [exp	perimental] Favour (can captrol)
	(P = 0.75)				Favours [exp	perimental] Favour (can captrol)
	(P = 0.75)				Favours [exp	perimental] Favour (can captrol)
	(P = 0.75)				Favours [exp	

41 of 75			BM	J Open		36/bmjopen	
. metan logrr selogrr,	label(na	mevar=author)	random efo	rm			
Study	ES	[95% Conf.	Interval]	% Weight		-2024-091507 ht, including	
Abby McCormack 2014	1.031	0.926	1.148	36.13		507 on	
Abby McCormack 2014a	1.149	1.024	1.290	35.00			
Abby McCormack 2014b	0.901	0.717	1.133	20.41		18 March Er. uses relat	
Carlotta Micaela Jar	0.990	0.510	1.921	3.97		rch Era	
Carlotta Micaela Jar	0.540	0.291	1.003	4.50		arch 2025. Erasmus	
D+L pooled ES	1.010	0.880	1.160	100.00		Downlo: shogesch	
Actually: diversity: OR=1.010, [95	%CI 0.880, 1.1	60].	60,			Downloaded from hogeschool .	
eFigure 5: Forest Plot Sh	owing the	Association Be	tween fruit a	nd tinnitus.	ę	ո http://br	
Black diamonds are the estimated pruit: OR=0.65, [95%CI 0.53,0.79]	pooled odd ration, I ² =0% p<0.00	o (OR) for each rando	om-effects meta-ar	alysis; Red box sizes	•	<u> </u>	es in the meta-a
			Odds Ratio		Odds Ratio	in br	

Study or Subgroup	log[Odds Ratio]	SE	Weight	Odds Ratio IV, Fixed, 95% CI	Odds Ratio and billion of the state of the s
Carlotta Micaela Jarach 2023a	-0.040822	0.3655756	7.7%	0.96 [0.47, 1.97]	nila vij
Carlotta Micaela Jarach 2023b	-0.2484614	0.3083197	10.9%	0.78 [0.43, 1.43]	ar e
Christopher Spankovich 2017	-0.4942963	0.2033897	25.0%	0.61 [0.41, 0.91]	n Ma
Diana Tang 2021a	-0.7550226	0.2457749	17.1%	0.47 [0.29, 0.76]	ay nnc
Diana Tang 2021b	-0.3856625	0.230163	19.5%	0.68 [0.43, 1.07]	
Diana Tang 2021c	-0.3710637	0.2290667	19.7%	0.69 [0.44, 1.08]	
Total (95% CI)			100.0%	0.65 [0.53, 0.79]	
Heterogeneity: Chi² = 3.43, df = 5	$5 (P = 0.63); I^2 = 0\%$				100 100
Test for overall effect: $Z = 4.24$ (F					0.01 0.1 1 100 100 100 100 Favours [experimental] Favours [control]
					EZ-LTA

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. metan logrr selogrr,	label(na	mevar=author)) fixed efor	m	6/bmjopen-2024-091507 on 18 March 2025 Erasmu by copyright, including for uses related to	
Study	ES	[95% Conf.	Interval]	% Weight	124-091 includi	
Carlotta Micaela Jar	0.960	0.469	1.965	7.74	507 o	
Carlotta Micaela Jar	0.780	0.426	1.427	10.88	r n 1	
Christopher Spankovi	0.610	0.409	0.909	25.01	ses Ma	
Diana Tang 2021a	0.470	0.290	0.761	17.13	arch Er	
Diana Tang 2021b	0.680	0.433	1.068	19.53	20: as n ted	
Diana Tang 2021d	0.690	0.440	1.081	19.72	25. Do nusho to te)	
I-V pooled ES	0.649	0.532	0.793	100.00	ownload gescho ct and da	
Actually: fruit: OR=0.649, [95%C	I 0.532, 0.793]				ded from htt lool . data mining,	
eFigure 6: Forest Plot Sl	nowing the	Association B	Setween fiber	and tinnitus.	http://b	
Black diamonds are the estimated priber: OR=0.92, [95%CI 0.85,0.99]			dom-effects meta-	analysis; Red box sizes	s reflect the relative with the apportioned	d to studies in the meta- analys
_		0	dds Ratio	Odd	Is Ratio	

				Odds Ratio		Odds	Ratio	nd
Study or Subgroup	log[Odds Ratio]	SE	Weight	IV, Random, 95% CI	IV, Random, 95% CI			<u>s</u>
Diana Tang 2021a	-0.5108256	0.243222	2.3%	0.60 [0.37, 0.97]	8	-		<u>⊒</u> .
Diana Tang 2021b	-0.1392621	0.2282217	2.6%	0.87 [0.56, 1.36]	(a)	50-0	-	ilar t
Diana Tang 2021c	-0.2613648	0.2306047	2.5%	0.77 [0.49, 1.21]	69		- 80	tech
Doh Young Lee 2018	0.003992	0.0022879	27.8%	1.00 [1.00, 1.01]			•	ξ
Piers Dawes 2020a	-0.0304592	0.0527859	18.3%	0.97 [0.87, 1.08]		-	539	nologies
Piers Dawes 2020b	-0.0943106	0.0588071	16.9%	0.91 [0.81, 1.02]		-	t	gie
Piers Dawes 2020c	-0.1508229	0.0622392	16.1%	0.86 [0.76, 0.97]		=		Ñ
Piers Dawes 2020d	-0.1392621	0.0759266	13.4%	0.87 [0.75, 1.01]			1	
Total (95% CI)			100.0%	0.92 [0.85, 0.99]		•		
Heterogeneity: Tau² = (0.01; Chi² = 19.09, d	df = 7 (P = 0.0)	$(08); I^2 = 0$	63%	0.5	0.7	1 1.5	
Test for overall effect: 2	Z = 2.21 (P = 0.03)				A000 00 TO 1	100 March 100	Favours [co	ontroll
					i avodia (ex	penmental	i avodis įco	ALL OIL

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1	. metan logrr selogrr	, label(na	mevar=author) random efo	rm	<u>©</u> 7
2	Study	ES	[95% Conf.	Interval]	% Weight	1t, including
4 5	Diana Tang 2021a	0.600	0.372	0.966	2.31	9150
5	Diana Tang 2021b	0.870	0.556	1.361	2.59	——————————————————————————————————————
7	Diana Tang 2021d	0.770	0.490	1.210	2.54	
8	Doh Young Lee 2018	1.004	1.000	1.009	27.81	us es M
9	Piers Dawes 2020a	0.970	0.875	1.076	18.30	
10	Piers Dawes 2020b	0.910	0.811	1.021	16.90	arch 20 Erass
11	Piers Dawes 2020c	0.860	0.761	0.972	16.14	h 202 ated t
12 13	Piers Dawes 2020d	0.870	0.750	1.010	13.40	o te
14 15	D+L pooled ES	0.918	0.851	0.990	100.00	Downloaded odd and data
16 17	Actually: fruit: OR=0.918, [9	+ 05%CI	 <mark>0 9901</mark>	,~N) _	data
18	rectually. Hult. OK 0.910, [5	737001 0.031,	<u>0.770</u>].			m. fro
19						
20	E'	. (1)	43 A •	. D.		d, tt
21	eFigure 7: Forest Plo	ot Showing	g the Associ	ation Betwe	en tat and tinnit	18.
22						ain <u>ä</u> i
23	Black diamonds are the estin	nated pooled o	dd ratio (OR) for	r each random-e	ffects meta-analysis; Re	d box sizes reflect the relative what apportioned to studies in the meta- analysis.
24	Fat: OR=1.07, [95%CI 0.97,					a n. t.
25					Odds Ratio	Odds Ratio 2 3
26	Study or Subgroup	log[Odds	Ratio]	SE Weight IV,	Random, 95% CI	IV, Random, 95% 🖨 🙎

-0.3710637	0.170/122		IV, Random, 95% CI	IV, Random, 95% 🖨 🙎
	0.1734132	5.9%	0.69 [0.49, 0.98]	nila
0.0029955	0.0010173	27.8%	1.00 [1.00, 1.01]	† r
0.0582689	0.0574609	20.2%	1.06 [0.95, 1.19]	n May
0.0861777	0.0700094	17.8%	1.09 [0.95, 1.25]	hno
0.1739534	0.0832964	15.5%	1.19 [1.01, 1.40]	log 19,
0.285179	0.1010838	12.8%	1.33 [1.09, 1.62]	2025
		100.0%	1.07 [0.97, 1.18]	5 at
= 18.68, df = 5 (P =	= 0.002); I ² =	73%	70 NO.	
= 0.16)				0.5 0.7 1 1.5 ਨੂੰ2 Favours [experimental] Favours [comਫ਼ਾol]
				nen
				t GE
	0.0861777 0.1739534 0.285179 : 18.68, df= 5 (P=		0.0861777 0.0700094 17.8% 0.1739534 0.0832964 15.5% 0.285179 0.1010838 12.8% 100.0% 18.68, df = 5 (P = 0.002); l² = 73%	0.0861777 0.0700094 17.8% 1.09 [0.95, 1.25] 0.1739534 0.0832964 15.5% 1.19 [1.01, 1.40] 0.285179 0.1010838 12.8% 1.33 [1.09, 1.62] 100.0% 1.07 [0.97, 1.18] 18.68, df = 5 (P = 0.002); = 73%

Study	ES	[95% Conf.	Interval]	% Weight	
Christopher Spankovi	0.690	0.485	0.981	5.95	
Doh Young Lee 2018	1.003	1.001	1.005	27.75	
Piers Dawes 2020a	1.060	0.947	1.186	20.17	
Piers Dawes 2020b	1.090	0.950	1.250	17.81	
Piers Dawes 2020c	1.190	1.011	1.401	15.50	
Piers Dawes 2020d	1.330	1.091	1.621	12.82	
D+L pooled ES	1.072	0.973	1.181	100.00	

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Study	ES	[95% Conf.	Interval]] % Weight	t							
Christopher Spankovi	0.690	0.485	0.981	5.95)1507				
Doh Young Lee 2018	1.003	1.001	1.005	27.75			3	î on				
Piers Dawes 2020a	1.060	0.947	1.186	20.17			2					
Piers Dawes 2020b	1.090	0.950	1.250	17.81			ğ	 				
Piers Dawes 2020c	1.190	1.011	1.401	15.50			9	arc				
Piers Dawes 2020d	1.330	1.091	1.621	12.82			מופת	8 March 2025. Erasmus				
D+L pooled ES	1.072	0.973	1.181	100.00				25. Downloaded nushogeschool				
			ation Dat	10/h		: 4	ā E	d from htt				
Actually: fat: OR=1.072, [95% eFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI	t Showing	g the Associ dd ratio (OR) for 2=0% p=0.20.	each randon	. (alysis; Red box		ي Ratio	from http://bm.bht webpen.bmj	apportio	ned to st	tudies in	the meta- a
eFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI	t Showing ated pooled o 0.90,1.63], I log[Odd	g the Associ dd ratio (OR) for 2=0% p=0.20.	seach randon SE Weight 302 3.0%	n-effects meta-ana Odds Ratio IV, Fixed, 95% CI 1.35 [0.25, 7.36]	alysis; Red box	sizes reflect t	ي Ratio	from http://bm.bht webpen.bmj	apportio	ned to st	tudies in	the meta- a
eFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Carlotta Micaela Jarach 2023	t Showing ated pooled o 0.90,1.63], I log[Odd: a 0.3 b 0.3	g the Associ dd ratio (OR) for the form of the period of	se Weight 502 3.0% 543 2.3%	Odds Ratio N, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89]	alysis; Red box	sizes reflect t	Ratio 9 , 95% CI 0	from http://bm.ppen.bmj.com/ o	apportio	ned to st	tudies in	the meta- a
EFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Milena Tomanic 2020	t Showing ated pooled o 0.90,1.63], I log[Odd: a 0.3 b 0.3	g the Associ dd ratio (OR) fo. 2=0% p=0.20. s Ratiol 001046 0.8652	se Weight 602 3.0% 543 2.3% 309 94.7%	n-effects meta-ana Odds Ratio IV, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89] 1.20 [0.89, 1.63]	alysis; Red box	sizes reflect t	Ratio 9, 95% CI 0	from http://bm.ppen.bmj.com/ o	apportion	ned to st	tudies in	the meta- a
EFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Milena Tomanic 2020 Total (95% CI)	t Showing ated pooled o 0.90,1.63], I log[Odd: a	dd ratio (OR) for 2=0% p=0.20. SRatio 001046 0.8652 364722 0.9974 856494 0.154	se Weight 602 3.0% 543 2.3% 309 94.7%	Odds Ratio N, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89]	alysis; Red box	sizes reflect t	ي Ratio	from http://bm/bpen.bmj.com/ on May	apportion	ned to st	tudies in	the meta- a
EFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Carlotta Micaela Jarach 2023 Milena Tomanic 2020 Total (95% CI) Heterogeneity: Chi² = 0.04, df	t Showing ated pooled o 0.90,1.63], I log[Odd: a	dd ratio (OR) for 2=0% p=0.20. SRatio 001046 0.8652 364722 0.9974 856494 0.154	se Weight 602 3.0% 543 2.3% 309 94.7%	n-effects meta-ana Odds Ratio IV, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89] 1.20 [0.89, 1.63]	alysis; Red box	Odds IV, Fixed,	Ratio 9	from http://bm.ppen.bmj.com/ on May 19	apportion	ned to st	tudies in	the meta- a
EFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Milena Tomanic 2020 Total (95% CI)	t Showing ated pooled o 0.90,1.63], I log[Odd: a	dd ratio (OR) for 2=0% p=0.20. SRatio 001046 0.8652 364722 0.9974 856494 0.154	se Weight 602 3.0% 543 2.3% 309 94.7%	n-effects meta-ana Odds Ratio IV, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89] 1.20 [0.89, 1.63]	alysis; Red box	Odds IV, Fixed,	Ratio 95% CI 95% CI	from http://bm.bpen.bmj.com/ on May 19, 20		ned to st	tudies in	the meta- a
eFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Carlotta Micaela Jarach 2023 Milena Tomanic 2020 Total (95% CI) Heterogeneity: Chi² = 0.04, df	t Showing ated pooled o 0.90,1.63], I log[Odd: a	dd ratio (OR) for 2=0% p=0.20. SRatio 001046 0.8652 364722 0.9974 856494 0.154	se Weight 602 3.0% 543 2.3% 309 94.7%	n-effects meta-ana Odds Ratio IV, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89] 1.20 [0.89, 1.63]	alysis; Red box	Odds IV, Fixed	Ratio 95% CI 95% CI	from http://bm.pepen.bmj.com/ on May 19, 2025		ned to st	tudies in	the meta- a
Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Carlotta Micaela Jarach 2023 Milena Tomanic 2020 Total (95% CI) Heterogeneity: Chi² = 0.04, df	t Showing ated pooled o 0.90,1.63], I log[Odd: a	dd ratio (OR) for 2=0% p=0.20. SRatio 001046 0.8652 364722 0.9974 856494 0.154	se Weight 602 3.0% 543 2.3% 309 94.7%	n-effects meta-ana Odds Ratio IV, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89] 1.20 [0.89, 1.63]	alysis; Red box	Odds IV, Fixed	Ratio 95% CI 95% CI	from http://bm.pepen.bmj.com/ on May 19, 2025		ned to st	tudies in	the meta- a
eFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Carlotta Micaela Jarach 2023 Milena Tomanic 2020 Total (95% CI) Heterogeneity: Chi² = 0.04, df	t Showing ated pooled o 0.90,1.63], I log[Odd: a	dd ratio (OR) for 2=0% p=0.20. SRatio 001046 0.8652 364722 0.9974 856494 0.154	se Weight 602 3.0% 543 2.3% 309 94.7%	n-effects meta-ana Odds Ratio IV, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89] 1.20 [0.89, 1.63]	alysis; Red box	Odds IV, Fixed	Ratio 95% CI 95% CI	from http://bm.pepen.bmj.com/ on May 19, 2025		ned to st	tudies in	the meta- a
eFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Carlotta Micaela Jarach 2023 Milena Tomanic 2020 Total (95% CI) Heterogeneity: Chi² = 0.04, df	t Showing ated pooled o 0.90,1.63], I log[Odd: a	dd ratio (OR) for 2=0% p=0.20. SRatio 001046 0.8652 364722 0.9974 856494 0.154	se Weight 602 3.0% 543 2.3% 309 94.7%	n-effects meta-ana Odds Ratio IV, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89] 1.20 [0.89, 1.63]	alysis; Red box	Odds IV, Fixed	Ratio 95% CI 95% CI	from http://bm.pepen.bmj.com/ on May 19, 2025		ned to st	tudies in	the meta- a
eFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Carlotta Micaela Jarach 2023 Milena Tomanic 2020 Total (95% CI) Heterogeneity: Chi² = 0.04, df	t Showing ated pooled o 0.90,1.63], I log[Odd: a	dd ratio (OR) for 2=0% p=0.20. SRatio 001046 0.8652 364722 0.9974 856494 0.154	se Weight 602 3.0% 543 2.3% 309 94.7%	n-effects meta-ana Odds Ratio IV, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89] 1.20 [0.89, 1.63]	alysis; Red box	Odds IV, Fixed	Ratio 95% CI 95% CI	from http://bm.pepen.bmj.com/ on May 19, 2025		ned to st	tudies in	the meta- a
eFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Carlotta Micaela Jarach 2023 Milena Tomanic 2020 Total (95% CI) Heterogeneity: Chi² = 0.04, df	t Showing ated pooled o 0.90,1.63], I log[Odd: a	dd ratio (OR) for 2=0% p=0.20. SRatio 001046 0.8652 364722 0.9974 856494 0.154	se Weight 602 3.0% 543 2.3% 309 94.7%	n-effects meta-ana Odds Ratio IV, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89] 1.20 [0.89, 1.63]	alysis; Red box	Odds IV, Fixed	Ratio 95% CI 95% CI	from http://bm.bpen.bmj.com/ on May 19, 20		ned to st	tudies in	the meta- a

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Study	ES	[9!	5% Conf.	Interval]	% Weight	-09150 cluding	
Carlotta Micaela Ja	ar 1.35 0)	0.248	7.359	3.01	7 on 7	
Carlotta Micaela Ja	ar 1.400)	0.198	9.889	2.27	18 N	
			0.887	1.624	94.72	larch 20 Eras	
I-V pooled ES	1.208	3	0.900	1.622	100.00)25. Do	
	+					wnlo ges ano	
Actually: margarine: OR=1 208 [95%CL0 900_1 6	221				oade choc	
rictainy. margarine. Or 1.200,	2570010.500, 1.02	-2].				ed f	
						ni. rom	
eFigure 9: Forest Plot S	howing the A	ssociatio	n Between	n meat and tinn	itus.	ո http://	
Black diamonds are the estimated	pooled odd ratio (OR) for each	n random-effe	cts meta-analysis; Red	box sizes reflect the relative	weight apportioned to studies	in the meta- analysis.
		,				ing	•
			Ode	ds Ratio	Odds Ratio	, an.b	
Study or Subgroup	log[Odds Ratio]	SE	Weight IV, Fi	xed, 95% CI	IV, Fixed, 95% CI	<u>d</u> <u>3</u>	
Carlotta Micaela Jarach 2023a						in C	
Carlotta Micaela Jarach 2023b						n/ c	
	Carlotta Micaela Ja Carlotta Micaela Ja Milena Tomanic 2020 I-V pooled ES Actually: margarine: OR=1.208, Ja Black diamonds are the estimated Meat: OR=1.10, [95%CI 0.78,1.5] Study or Subgroup Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b	Carlotta Micaela Jar 1.356 Carlotta Micaela Jar 1.406 Milena Tomanic 2020 1.206 I-V pooled ES 1.208 Actually: margarine: OR=1.208, [95%CI 0.900, 1.62 eFigure 9: Forest Plot Showing the A Black diamonds are the estimated pooled odd ratio (Meat: OR=1.10, [95%CI 0.78,1.54], I²=0% p=0.59. Study or Subgroup log[Odds Ratio] Carlotta Micaela Jarach 2023a 0.3987761 -0.0304592	Carlotta Micaela Jar 1.350 Carlotta Micaela Jar 1.400 Milena Tomanic 2020 1.200 I-V pooled ES 1.208 Actually: margarine: OR=1.208, [95%CI 0.900, 1.622]. eFigure 9: Forest Plot Showing the Associatio Black diamonds are the estimated pooled odd ratio (OR) for each Meat: OR=1.10, [95%CI 0.78,1.54], I²=0% p=0.59. Study or Subgroup log[Odds Ratio] SE Carlotta Micaela Jarach 2023a 0.3987761 0.3484928 Carlotta Micaela Jarach 2023b -0.0304592 0.3287067	Carlotta Micaela Jar 1.350	Carlotta Micaela Jar 1.350 0.248 7.359 Carlotta Micaela Jar 1.400 0.198 9.889 Milena Tomanic 2020 1.200 0.887 1.624 I-V pooled ES 1.208 0.900 1.622 Actually: margarine: OR=1.208, [95%CI 0.900, 1.622]. PeFigure 9: Forest Plot Showing the Association Between meat and tinning Black diamonds are the estimated pooled odd ratio (OR) for each random-effects meta-analysis; Red Meat: OR=1.10, [95%CI 0.78,1.54], I²=0% p=0.59. Odds Ratio Study or Subgroup log[Odds Ratio] SE Weight IV, Fixed, 95% CI Carlotta Micaela Jarach 2023a 0.3987761 0.3484928 24.6% 1.49 [0.75, 2.95] Carlotta Micaela Jarach 2023b -0.0304592 0.3287067 27.6% 0.97 [0.51, 1.85]	Carlotta Micaela Jar 1.350 0.248 7.359 3.01 Carlotta Micaela Jar 1.400 0.198 9.889 2.27 Milena Tomanic 2020 1.200 0.887 1.624 94.72 I-V pooled ES 1.208 0.900 1.622 100.00 Actually: margarine: OR=1.208, [95%CI 0.900, 1.622]. eFigure 9: Forest Plot Showing the Association Between meat and tinnitus. Black diamonds are the estimated pooled odd ratio (OR) for each random-effects meta-analysis; Red box sizes reflect the relative Meat: OR=1.10, [95%CI 0.78,1.54], I²=0% p=0.59. Odds Ratio Study or Subgroup log Odds Ratio SE Weight V. Fixed, 95% CI V. Fixed, 95% CI Carlotta Micaela Jarach 2023a 0.3987761 0.3484928 24.6% 1.49 [0.75, 2.95] Carlotta Micaela Jarach 2023b -0.0304592 0.3287067 27.6% 0.97 [0.51, 1.85]	Carlotta Micaela Jar 1.350 0.248 7.359 3.01 0.248 7.359 3.01 0.248 7.359 3.01 0.248 7.359 3.01 0.248 7.359 3.01 0.248 7.359 3.01 0.248 7.359 3.01 0.248 0.248 7.359 3.01 0.248

Study or Subgroup	log[Odds Ratio]	SE	Weight	Odds Ratio IV, Fixed, 95% CI	Odds Ratio IV, Fixed, 95% CI	n.bm J, and	
Carlotta Micaela Jarach 2023a	0.3987761	0.3484928	24.6%	1.49 [0.75, 2.95]	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	sim :	
Carlotta Micaela Jarach 2023b	-0.0304592	0.3287067	27.6%	0.97 [0.51, 1.85]	-	ıila	
Christopher Spankovich 2017	0.0099503	0.2496967	47.8%	1.01 [0.62, 1.65]	3 - -	on I	
Total (95% CI)			100.0%	1.10 [0.78, 1.54]	•	May chno	
Heterogeneity: Chiz = 1.02, df = 1	$2 (P = 0.60); I^2 = 0\%$	i			0.01	<u>0</u> 1 0	400
Test for overall effect: Z = 0.55 (F	P = 0.59)				0.01 0.1 1 Favours [experimental] Favours	2025 at [@ntr5 at	100

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Study	ES	[95% Conf.	Interval]	% Weight	4-09150 acludin
Carlotta Micaela Jar Carlotta Micaela Jar Christopher Spankovi	1.490 0.970 1.010	0.753 0.509 0.619	2.950 1.847 1.648	24.56 27.60 47.84	7 on 18 March 20 Erasi g for uses related
I-V pooled ES	1.099	0.783	1.542	100.00	25. Dow nushoge to text a
Actually: meat: OR=1.099, [95%CI 0.783	3, 1.542].	MA		·	hloaded i school .

eFigure 10: Forest Plot Showing the Association Between sugar and tinnitus.

Black diamonds are the estimated pooled odd ratio (OR) for each random-effects meta-analysis; Red box sizes reflect the relative weight apportioned to studies in the meta-analysis. Sugar: OR=1.00, [95%CI 0.97,1.03], I²=0% p=0.84.

Study or Subgroup	log[Odds Ratio]	SE	Weight	Odds Ratio IV, Fixed, 95% CI	Odds Ratio a 5 IV, Fixed, 95% CI 3.
Abby McCormack 2014a	0	0.0230439	44.3%	1.00 [0.96, 1.05]	win is
Abby McCormack 2014b	0.0099503	0.0233327	43.2%	1.01 [0.96, 1.06]	ii Z
Abby McCormack 2014c	-0.0294288	0.0469906	10.7%	0.97 [0.89, 1.06]	r te on
Carlotta Micaela Jarach 2023a	-0.0725707	0.3247361	0.2%	0.93 [0.49, 1.76]	The Management of the Manageme
Carlotta Micaela Jarach 2023b	-0.210721	0.3237852	0.2%	0.81 [0.43, 1.53]	+ <u>5 3</u>
Diana Tang 2021a	-0.4462871	0.236286	0.4%	0.64 [0.40, 1.02]	• • • • • • • • • • • • • • • • • • •
Diana Tang 2021b	-0.0618754	0.2243772	0.5%	0.94 [0.61, 1.46]	ii 20:
Diana Tang 2021c	-0.356675	0.2383442	0.4%	0.70 [0.44, 1.12]	9s.
Fotal (95% CI)			100.0%	1.00 [0.97, 1.03]	D _{ep}
Heterogeneity: Chi² = 6.89, df = 3	$7 (P = 0.44); I^2 = 0\%$,			
Test for overall effect: Z = 0.20 (F	9 = 0.84				0.7 0.85 1 1.2 물5 Favours [experimental] Favours [contr e l]
					avours [experimental]
					G E
					Ž
					ΔT.

Study	ES	[95% Conf.	Interval]	% Weight	
Abby McCormack 2014	1.000	0.956	1.046	44.34	
Abby McCormack 2014a	1.010	0.965	1.057	43.25	
Abby McCormack 2014b	0.971	0.886	1.065	10.66	
Carlotta Micaela Jar	0.930	0.492	1.758	0.22	
Carlotta Micaela Jar	0.810	0.429	1.528	0.22	
Diana Tang 2021a	0.640	0.403	1.017	0.42	
Diana Tang 2021b	0.940	0.606	1.459	0.47	
Diana Tang 2021c	0.700	0.439	1.117	0.41	
I-V pooled ES	0.997	0.967	1.027	100.00	

Page	47 of 75					BMJ Open		36/bm,		
1	. metan logrr selog	grr, label	(namevar=	author) fixed efor	m		6/bmjopen-20 by copyright,		
2	Study	E	S [95%	Conf.	Interval]	% Weight				
4 5	Abby McCormack 2014	1 1.00	ø e	956	1.046	44.34	1000)24-091507 on including for		
6	Abby McCormack 2014	la 1.01	9 6	.965	1.057	43.25		7 on		
7	Abby McCormack 2014	16 0.97	1 6	.886	1.065	10.66		n 18		
8	Carlotta Micaela Ja	er 0.93	9 8	.492	1.758	0.22		18 Ma		
9	Carlotta Micaela Ja	ar 0.81	0 0	.429	1.528	0.22		arci Feli		
10	Diana Tang 2021a	0.64	9 6	.403	1.017	0.42		h 20 ras		
11 12	Diana Tang 2021b	0.94		.606	1.459	0.47		D25 mu to		
13	Diana Tang 2021c	0.70		.439	1.117	0.41		. Dow shog text		
14 15 16	I-V pooled ES	0.99	7 6	967	1.027	100.00		March 2025. Downloaded from http://bmjop Erasmushogeschool es related to text and data mining, Al trainin		
22 23 24 25 26	eFigure 11: Forest I Black diamonds are the esti Fish: OR=1.00, [95%CI 1.0	mated pooled	odd ratio (OI		ch random-effects		pox sizes reflect the relative	ဖြင့် v မွှောwe မျှောht apporti	ioned to studies in the meta-analy	sis.
27	Cturbs or Cuberous Io	alOddo Datiol	er.	Majabi	Odds Ratio	1	Odds Ratio	j.com/ simila		
28	Study or Subgroup lo Doh Young Lee 2018	g[Odds Ratio]			IV, Fixed, 95% CI	(a)	V, Fixed, 95% CI			
29	Piers Dawes 2020a		0.0007634 0.0546964		1.00 [1.00, 1.00] 1.02 [0.92, 1.14]		—	ech		
30	Piers Dawes 2020b	0.0190020	0.060906		1.01 [0.90, 1.14]			May 19, chnolog		
31 32	Piers Dawes 2020c	-0.0304592			0.97 [0.85, 1.11]		4	ın May 19, 202 technologies.		
33	Piers Dawes 2020d		0.0858348		1.06 [0.90, 1.25]			2025 jies.		
34										
35	Total (95% CI)			100.0%	1.00 [1.00, 1.00]			Ď		
36	Heterogeneity: Chi ² = 0.78,		5.00			0.01 0.1	1 10	a 00		
37	Test for overall effect: $Z = 2$.62 (P = 0.009)					nental] Favours [control]	T T		
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Study	ES .	[95% Conf. Interval]	% Weight
Doh Young Lee 2018	1.002	1.001 1.004	99.94
Piers Dawes 2020a	1.020	0.91 6 1.135	0.02
Piers Dawes 2020b	1.010	0.896 1.138	0.02
Piers Dawes 2020c	0.970	0.849 1.108	0.01
Piers Dawes 2020d	1.060	0.896 1.254	0.01
I-V pooled ES	1.002	1.001 1.004	100.00

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Study	ES [95% Conf.	. Interva	al] % Wei	ght		by copyright, including for				
Doh Young Lee 2018	1.002	1.001	1.004	4 99.	94		ing fo	507 D			
Piers Dawes 2020a	1.020	0.916	1.13	5 0.	02		for use	<u> </u>			
Piers Dawes 2020b	1.010	0.896	1.138	8 0.	02		uses	6 S			
Piers Dawes 2020c	0.970	0.849	1.10	8 0.	01		E III	3			
Piers Dawes 2020d	1.060	0.896	1.25				rasm ated t	ร ว			
I-V pooled ES	1.002	1.001	1.004	4 100.	00		usho to text	Э			
eFigure 12: Forest Plot	Showing the	Associat	ion Rotu	veen fish and	tinnitus		ining,	3			
eFigure 12: Forest Plot Black diamonds are the estimate Fish: OR = 0.98 [95%/CL 0.91 1.0	d pooled odd ratio	(OR) for eac				lect the relat	₹ .	ght appor	tioned to	studies in	the meta-ana
Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0	d pooled odd ratio 5], I ² =72% p=0.57	(OR) for eac	ch random-e	ffects meta-analysi	s; Red box sizes ref	Odds Ratio	traging, a	ght appor	tioned to	studies in	the meta-ana
Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0	d pooled odd ratio 5], I ² =72% p=0.57 log[Odds Ratio]	(OR) for eac	ch random-e Weight IV	ffects meta-analysi Odds Ratio , Random, 95% Cl	s; Red box sizes ref		trawer iveng, and	ght appor	tioned to	studies in	the meta-ana
Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0 Study or Subgroup Abby McCormack 2014a	d pooled odd ratio 5], I ² =72% p=0.57 log[Odds Ratio] -0.0202027	(OR) for each	weight W	ffects meta-analysi Odds Ratio , Random, 95% CI 0.98 [0.95, 1.02]	s; Red box sizes ref	Odds Ratio	trawer iveng, and	ght appor	tioned to	studies in	the meta-ana
Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0	d pooled odd ratio 5], I ² =72% p=0.57 log[Odds Ratio]	(OR) for eac SE 0.0181367 0.0197415	ch random-e Weight IV	ffects meta-analysi Odds Ratio , Random, 95% CI 0.98 [0.95, 1.02] 0.91 [0.88, 0.95]	s; Red box sizes ref	Odds Ratio	traway iving, and simila	ght appor	tioned to	studies in	the meta-ana
Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0 Study or Subgroup Abby McCormack 2014a Abby McCormack 2014b	d pooled odd ratio S], I ² =72% p=0.57 log[Odds Ratio]	(OR) for eac SE 0.0181367 0.0197415	Weight IV 34.4% 33.9%	ffects meta-analysi Odds Ratio , Random, 95% CI 0.98 [0.95, 1.02]	s; Red box sizes ref	Odds Ratio	trawing, and similar te	ght appor	tioned to	studies in	the meta-ana
Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0 Study or Subgroup Abby McCormack 2014a Abby McCormack 2014b Abby McCormack 2014c Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b	d pooled odd ratio [5], I ² =72% p=0.57 log[Odds Ratio] -0.0202027 -0.0943106 0.0769611 0.1739534 -0.2876821	(OR) for each	Weight IV 34.4% 33.9% 25.8% 1.0% 1.3%	ffects meta-analysi Odds Ratio (Random, 95% CI 0.98 [0.95, 1.02] 0.91 [0.88, 0.95] 1.08 [1.00, 1.17] 1.19 [0.59, 2.39] 0.75 [0.41, 1.39]	s; Red box sizes ref	Odds Ratio	trawing, and similar techr	ght appor	tioned to	studies in	the meta-ana
Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0 Study or Subgroup Abby McCormack 2014a Abby McCormack 2014b Abby McCormack 2014c Carlotta Micaela Jarach 2023a	d pooled odd ratio [5], I ² =72% p=0.57 log[Odds Ratio] -0.0202027 -0.0943106 0.0769611 0.1739534 -0.2876821	(OR) for each	Weight IV 34.4% 33.9% 25.8% 1.0%	ffects meta-analysi Odds Ratio , Random, 95% Cl 0.98 [0.95, 1.02] 0.91 [0.88, 0.95] 1.08 [1.00, 1.17] 1.19 [0.59, 2.39]	s; Red box sizes ref	Odds Ratio	trawing, and similar technolog	ght appor	tioned to	studies in	the meta-ana
Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0] Study or Subgroup Abby McCormack 2014a Abby McCormack 2014b Abby McCormack 2014c Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b Milena Tomanic 2020	d pooled odd ratio [5], I ² =72% p=0.57 log[Odds Ratio] -0.0202027 -0.0943106 0.0769611 0.1739534 -0.2876821	(OR) for each	Weight IV 34.4% 33.9% 25.8% 1.0% 1.3% 3.6%	ffects meta-analysi Odds Ratio Random, 95% CI 0.98 [0.95, 1.02] 0.91 [0.88, 0.95] 1.08 [1.00, 1.17] 1.19 [0.59, 2.39] 0.75 [0.41, 1.39] 1.00 [0.70, 1.44]	s; Red box sizes ref	Odds Ratio	trawing, and similar technolog	ght appor	tioned to	studies in	the meta-ana
Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0] Study or Subgroup Abby McCormack 2014a Abby McCormack 2014b Abby McCormack 2014c Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b Milena Tomanic 2020 Total (95% CI)	d pooled odd ratio [5], I ² =72% p=0.57 log[Odds Ratio] -0.0202027 -0.0943106 0.0769611 0.1739534 -0.2876821 0.003992	(OR) for each	Weight IV 34.4% 33.9% 25.8% 1.0% 1.3% 3.6%	ffects meta-analysi Odds Ratio (Random, 95% CI 0.98 [0.95, 1.02] 0.91 [0.88, 0.95] 1.08 [1.00, 1.17] 1.19 [0.59, 2.39] 0.75 [0.41, 1.39]	s; Red box sizes ref	Odds Ratio	traibing, and similar technologies.	th appor	— →	studies in	the meta-ana
Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0] Study or Subgroup Abby McCormack 2014a Abby McCormack 2014b Abby McCormack 2014c Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b Milena Tomanic 2020	d pooled odd ratio S], I ² =72% p=0.57 log[Odds Ratio]	(OR) for each	Weight IV 34.4% 33.9% 25.8% 1.0% 1.3% 3.6%	ffects meta-analysi Odds Ratio Random, 95% CI 0.98 [0.95, 1.02] 0.91 [0.88, 0.95] 1.08 [1.00, 1.17] 1.19 [0.59, 2.39] 0.75 [0.41, 1.39] 1.00 [0.70, 1.44]	s; Red box sizes ref	Odds Ratio	trawing, and similar technologies.	th appor	tioned to	studies in	the meta-ana
Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0] Study or Subgroup Abby McCormack 2014a Abby McCormack 2014b Abby McCormack 2014c Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b Milena Tomanic 2020 Total (95% CI) Heterogeneity: Tau² = 0.00; Chi²	d pooled odd ratio S], I ² =72% p=0.57 log[Odds Ratio]	(OR) for each	Weight IV 34.4% 33.9% 25.8% 1.0% 1.3% 3.6%	ffects meta-analysi Odds Ratio Random, 95% CI 0.98 [0.95, 1.02] 0.91 [0.88, 0.95] 1.08 [1.00, 1.17] 1.19 [0.59, 2.39] 0.75 [0.41, 1.39] 1.00 [0.70, 1.44]	s; Red box sizes ref	Odds Ratio	trawing, and similar technologies.	th appor	— →	studies in	the meta-ana
Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0] Study or Subgroup Abby McCormack 2014a Abby McCormack 2014b Abby McCormack 2014c Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b Milena Tomanic 2020 Total (95% CI) Heterogeneity: Tau² = 0.00; Chi²	d pooled odd ratio S], I ² =72% p=0.57 log[Odds Ratio]	(OR) for each	Weight IV 34.4% 33.9% 25.8% 1.0% 1.3% 3.6%	ffects meta-analysi Odds Ratio Random, 95% CI 0.98 [0.95, 1.02] 0.91 [0.88, 0.95] 1.08 [1.00, 1.17] 1.19 [0.59, 2.39] 0.75 [0.41, 1.39] 1.00 [0.70, 1.44]	s; Red box sizes ref	Odds Ratio	trawing, and similar technologies.	th appor	— →	studies in	the meta-ana
Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0] Study or Subgroup Abby McCormack 2014a Abby McCormack 2014b Abby McCormack 2014c Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b Milena Tomanic 2020 Total (95% CI) Heterogeneity: Tau² = 0.00; Chi²	d pooled odd ratio S], I ² =72% p=0.57 log[Odds Ratio]	(OR) for each	Weight IV 34.4% 33.9% 25.8% 1.0% 1.3% 3.6%	ffects meta-analysi Odds Ratio Random, 95% CI 0.98 [0.95, 1.02] 0.91 [0.88, 0.95] 1.08 [1.00, 1.17] 1.19 [0.59, 2.39] 0.75 [0.41, 1.39] 1.00 [0.70, 1.44]	s; Red box sizes ref	Odds Ratio	trawing, and similar technologies.	th appor	— →	studies in	the meta-ana
Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0] Study or Subgroup Abby McCormack 2014a Abby McCormack 2014b Abby McCormack 2014c Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b Milena Tomanic 2020 Total (95% CI) Heterogeneity: Tau² = 0.00; Chi²	d pooled odd ratio S], I ² =72% p=0.57 log[Odds Ratio]	(OR) for each	Weight IV 34.4% 33.9% 25.8% 1.0% 1.3% 3.6%	ffects meta-analysi Odds Ratio Random, 95% CI 0.98 [0.95, 1.02] 0.91 [0.88, 0.95] 1.08 [1.00, 1.17] 1.19 [0.59, 2.39] 0.75 [0.41, 1.39] 1.00 [0.70, 1.44]	s; Red box sizes ref	Odds Ratio	trawing, and similar technologies.	th appor	— →	studies in	the meta-ana

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Study	ES	[95% Conf.	Interval]	% Weight	
Abby McCormack 2014 Abby McCormack 2014a	0.980 0.910	0.946 0.875	1.015 0.946	35.43 34.93	
Abby McCormack 2014b	1.080	0.998	1.169	27.04	
Carlotta Micaela Jar Carlotta Micaela Jar	1.190 0.750	0.593 0.406	2.390 1.386	1.14 1.46	
D+L pooled ES	0.979	0.907	1.056	100.00	

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2 3 4	Study	ES	[95% Cor	nf. Ir	nterval]	% Weight	, including for	-2024-091507			
5	Abby McCormack 2014	0.980	0.946	6	1.015	35.43	ling f				
6 7	Abby McCormack 2014a	0.910	0.875	5	0.946	34.93		on `			
8	Abby McCormack 2014b	1.080	0.998	8	1.169	27.04	uses	<u>8</u>			
9	Carlotta Micaela Jar	1.190	0.593	3	2.390	1.14	re	larc E			
10 11	Carlotta Micaela Jar	0.750	0.406	6	1.386	1.46	related	18 March 2025. Erasmu			
12 13	D+L pooled ES	0.979	0.907	 7	1.056	100.00	~				
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15 16	Actually: fish: OR=0.979, [95%C	CI 0.907, 1.056].					da	hoc thoc			
17		,,					ta n	. ₹. . ₹.			
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19 20	eFigure 13: Forest Plot	Showing the	Associati	ion Be	tween vegeta	able and tinnitus.	ng,	htt			
21	8	8					A E	p://l			
22	Black diamonds are the estimated	pooled odd ratio	(OR) for eac	h randon	n-effects meta-ana	alysis; Red box sizes refle	ct the relatives	veitht appo	rtioned to st	udies in the me	eta- analysis.
23	Vegetable: OR=1.10, [95%CI 0.9	1,1.34], I ² =0% p=	=0.33				ing	bpe			•
24 25	1000 St 52500	to recover account	9 80005	\$99000000	Odds Ratio		ds Ratio and ced, 95% CI	n.b			
26	Study or Subgroup	log[Odds Ratio]		- Party (1000) (1000)	IV, Fixed, 95% CI	IV, Fix	ced, 95% Cl o	<u>om</u>			
27	Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b	-0.2613648 -0.2876821	0.3602729		0.77 [0.38, 1.56] 0.75 [0.40, 1.41]	- 10 <u>- 10 - 10 - 10 - 10 - 10 - 10 - 10</u>	similar	com/			
28	Christopher Spankovich 2017		0.321390		1.25 [0.89, 1.76]		ar t	v on			
29	Diana Tang 2021a		0.2411069		1.32 [0.82, 2.12]	9 0	tec				
30	Diana Tang 2021b	-0.0304592			0.97 [0.60, 1.56]		• no	ay			
31	Diana Tang 2021c		0.2357803		1.19 [0.75, 1.89]	95	¢hnologies	May 19,			
32 33	T. J. 1 (05) (0)			400.0%	4 40 50 04 4 043		ies.	2025			
34	Total (95% CI)	(D 0.53) 13 00(100.0%	1.10 [0.91, 1.34]	i i		Ω Ω	1		
35	Heterogeneity: Chi ² = 3.88, df = 5 Test for overall effect: Z = 0.98 (P		i			0.2 0.5	1 2	Ď	5		
36	Test for overall effect. Z = 0.98 (P	= 0.33)				Favours [experimenta	al] Favours [cor	ntr & l]			
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Study	ES	[95% Conf.	Interval:] % Weight	including	24-091	
Carlotta Micaela Jar	0.770	0.380	1.560	7.56			
Carlotta Micaela Jar	0.750	0.399	1.408	9.50	for u	on	
Christopher Spankovi	1.250	0.886	1.763	31.89	IS es		
Diana Tang 2021a	1.320	0.823	2.117	16.88	8 Te _	<i>l</i> lar	
Diana Tang 2021b	0.970	0.602	1.564	16.52	Era	다. -	
Diana Tang 2021c	1.190	0.750	1.889	17.65	d to	2025.	
I-V pooled ES	1.101	0.907	1.337	100.00	Erasmushogeschool . uses related to text and data mining, Al tra	Down	
+					ichoc id da	loade	
Actually: vegetable: OR=1.101,	[95%CI 0.907	<mark>7, 1.337]</mark> .			ta .	<u>u</u>	
					n i	Ō	
					ji	<u>コ</u>	
eFigure 14: Forest Plot	C				= •	<u> </u>	
Black diamonds are the estimate Water: OR=1.00, [95%CI 0.99,1	ed pooled odd	ratio (OR) for eac	h random-effe	ects meta-analysis; Red box sizes re		th apportioned to studies in t	the meta- analysis.
water. OK-1.00, [93/6C1 0.99,1	.01], 120/6		Odds Ratio	Odds Ratio	and	 bn	
Study or Subgroup log	[Odds Ratio]	SE Weight IV		IV, Fixed, 95% CI	<u>s.</u>	⊒ . •	
Carlotta Micaela Jarach 2023a Doh Young Lee 2018 Milena Tomanic 2020	-0.1743534 0.3 0.0029955 0.0 0.1889661 0.3	0055957 99.8% 1	.84 [0.43, 1.65] .00 [0.99, 1.01] .21 [0.95, 1.54]	-	similar te	.bmj.com/ on May	
Total (95% CI)		100.0% 1	00 [0.99, 1.01]		c h	X	
Heterogeneity: Chi ² = 2.50, df = 2 (P =	0.29); F = 20%	100.0%	[0.33, 1.01]	- 4 1 1	technologies.	y 19,	
Test for overall effect: Z = 0.59 (P = 0.5				0.5 0.7 1 1.5 Favours [experimental] Favours [contri	of <u>G</u>	, 2	
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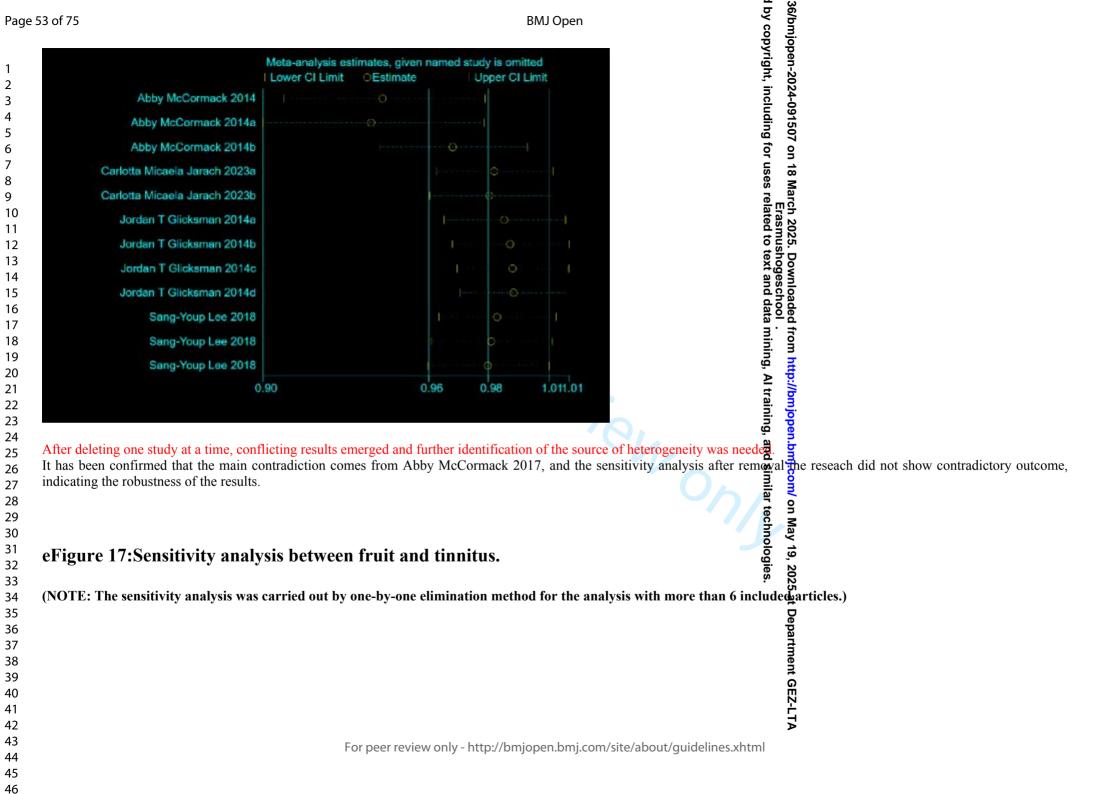
log[Odds Ratio]	SE	Weight	IV, Fixed, 95% CI		s Ratio <u>d,</u> 95% CI
-0.1743534	0.3430473	0.0%	0.84 [0.43, 1.65]	3 2 2	The second secon
0.0029955	0.0055957	99.8%	1.00 [0.99, 1.01]		
0.1889661	0.1243716	0.2%	1.21 [0.95, 1.54]		
		100.0%	1.00 [0.99, 1.01]		•
$(P = 0.29); P = 20^\circ$	X ₀			0.5 0.7	1 15 2
= 0.55)				Favours [experimental]	Favours [control]
	-0.1743534 0.0029955 0.1889661	-0.1743534 0.3430473 0.0029955 0.0055957 0.1889661 0.1243716	-0.1743534 0.3430473 0.0% 0.0029955 0.0055957 99.8% 0.1889661 0.1243716 0.2% (P = 0.29); P = 20%	10g Odds Ratio SE Weight IV, Fixed, 95% Cl -0.1743534 0.3430473 0.0% 0.84 [0.43, 1.65] -0.0029955 0.0055957 99.8% 1.00 [0.99, 1.01] -0.1889661 0.1243716 0.2% 1.21 [0.95, 1.54]	log[Odds Ratio] SE Weight IV, Fixed, 95% Cl IV, Fixed -0.1743534 0.3430473 0.0% 0.84 [0.43, 1.65] 0.0029955 0.0055957 99.8% 1.00 [0.99, 1.01] 0.1889661 0.1243716 0.2% 1.21 [0.95, 1.54] -1.00 [0.99, 1.01] 0.00% 1.00 [0.99, 1.01] 0.5 0.7

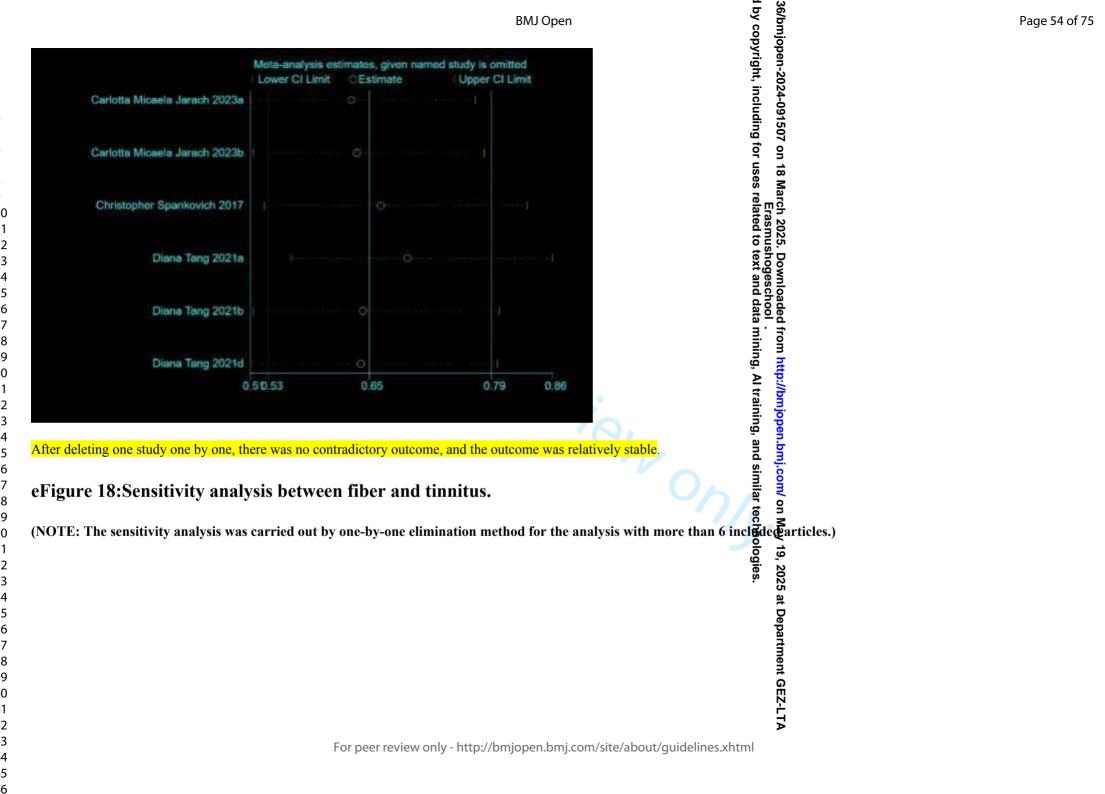
. metan logrr selog	,,				njopen-2024 opyright, in		
Study	ES	[95% Conf.	Interval]	% Weight	24-09150 includin		
Carlotta Micaela Ja		0.429	1.645	0.03	7 on 18		
Ooh Young Lee 2018	1.003	0.992	1.014	99.77	18 Ma		
Milena Tomanic 2020	1.210	0.950	1.541	0.21	rch 20 Eras elatec		
I-V pooled ES	1.003	0.992	1.014	100.00)25. Dov mushog to text		
Actually: water: OR=1.003, [95%C]	· +	<i>(</i>) _			/hload escho		
ottainy. water. Of 1.003, [73700]	1.0.772, 1.017 _] .				ted fi ool : ata n		
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Figure 15: Forest Plot SI	howing the Asso	ciation Between	dairy and tinniti	.21	ne -		
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Black diamonds are the estimated po	ooled odd ratio (OR) fo		10.		.tp:///	ortioned to stu	udies in the meta- a
Black diamonds are the estimated po	ooled odd ratio (OR) fo		10.		.tp:///	ortioned to stu	udies in the meta- a
Black diamonds are the estimated po	ooled odd ratio (OR) fo	or each random-effects	meta-analysis; Red box		tp://bpht app	ortioned to stu	udies in the meta- a
Black diamonds are the estimated polary: OR=0.83, [95%CI 0.77,0.89]	pooled odd ratio (OR) fo , I ² =0% p<0.00001		10.	sizes reflect the relat	tp://bpht app	ortioned to stu	udies in the meta- a
Black diamonds are the estimated polaring: OR=0.83, [95%CI 0.77,0.89] Study or Subgroup log[Odd: Abby McCormack 2014a -0.1	pooled odd ratio (OR) for p<0.00001 s Ratio SE Weight SE Weig	Odds Ratio N, Fixed, 95% CI 0.85 [0.75, 0.95]	meta-analysis; Red box Odds Ratio	sizes reflect the relat	tp://bpht app	ortioned to stu	udies in the meta- a
Black diamonds are the estimated polarity: OR=0.83, [95%CI 0.77,0.89] Study or Subgroup log[Odd: Abby McCormack 2014a -0.1 Abby McCormack 2014b -0.2	pooled odd ratio (OR) for p<0.00001 s Ratio SE Weight	Odds Ratio N, Fixed, 95% Cl	meta-analysis; Red box Odds Ratio	sizes reflect the relat	tp://bpht app	ortioned to stu	udies in the meta- a
Study or Subgroup log[Odd: Abby McCormack 2014a Abby McCormack 2014b Abby McCormack 2014b Abby McCormack 2014c -0.1	pooled odd ratio (OR) for p<0.00001 s Ratio SE Weight 655144 0.0603033 41.2 390169 0.0582753 44.1 310283 0.1153023 11.3	Odds Ratio N, Fixed, 95% Cl	meta-analysis; Red box Odds Ratio	sizes reflect the relat	tp://bpht app	ortioned to stu	udies in the meta- a
Study or Subgroup log[Odd: Abby McCormack 2014a -0.1 Abby McCormack 2014b -0.2 Abby McCormack 2014c -0.1 Christopher Spankovich 2017	s Ratiol SE Weig 655144 0.0603033 41.2 390169 0.0582753 44.1 310283 0.1153023 11.3 -0.0101 0.2069 3.5	Odds Ratio N, Fixed, 95% CI 0.85 [0.75, 0.95] 0.79 [0.70, 0.88] 0.88 [0.70, 1.10] 0.99 [0.66, 1.49]	meta-analysis; Red box Odds Ratio	sizes reflect the relat	tp://bpht app	ortioned to stu	udies in the meta- a
Slack diamonds are the estimated polarity: OR=0.83, [95%CI 0.77,0.89] Study or Subgroup log[Odd: Abby McCormack 2014a -0.1 Abby McCormack 2014b -0.2 Abby McCormack 2014c -0.1 Christopher Spankovich 2017 Total (95% CI)	s Ratio SE Weight SE Weigh	Odds Ratio N, Fixed, 95% CI 0.85 [0.75, 0.95] 0.79 [0.70, 0.88] 0.88 [0.70, 1.10]	Odds Ratio	sizes reflect the relat	app. .tp://brogopen.bmj.com/ on May 19, .v., Al trauning, and similar technolog	ortioned to stu	udies in the meta- a
Study or Subgroup logIOdd: Abby McCormack 2014b Abby McCormack 2014b Abby McCormack 2014b Abby McCormack 2014c -0.1	s Ratio SE Weight SE Weigh	Odds Ratio ht IV, Fixed, 95% CI % 0.85 [0.75, 0.95] % 0.79 [0.70, 0.88] % 0.88 [0.70, 1.10] % 0.99 [0.66, 1.49] 0.83 [0.77, 0.89]	Odds Ratio	sizes reflect the relat	app tp://bmgopen.bmj.com/ on May , Al training, and similar techno	ortioned to stu	udies in the meta- a
Study or Subgroup log[Odd: Abby McCormack 2014a -0.1 Abby McCormack 2014b -0.2 Abby McCormack 2014c -0.1 Christopher Spankovich 2017 Total (95% CI) Heterogeneity: Chi² = 1.89, df = 3 (P = 0.60	s Ratio SE Weight SE Weigh	Odds Ratio ht IV, Fixed, 95% CI % 0.85 [0.75, 0.95] % 0.79 [0.70, 0.88] % 0.88 [0.70, 1.10] % 0.99 [0.66, 1.49] 0.83 [0.77, 0.89]	Odds Ratio N, Fixed, 95%	sizes reflect the relat	app. .tp://brogopen.bmj.com/ on May 19, .v., Al trauning, and similar technolog	ortioned to stu	udies in the meta- a
Study or Subgroup log[Odd: Abby McCormack 2014a -0.1 Abby McCormack 2014b -0.2 Abby McCormack 2014c -0.1 Christopher Spankovich 2017 Total (95% CI) Heterogeneity: Chi² = 1.89, df = 3 (P = 0.60	s Ratio SE Weight SE Weigh	Odds Ratio ht IV, Fixed, 95% CI % 0.85 [0.75, 0.95] % 0.79 [0.70, 0.88] % 0.88 [0.70, 1.10] % 0.99 [0.66, 1.49] 0.83 [0.77, 0.89]	Odds Ratio N, Fixed, 95%	sizes reflect the relat	app.ttp://brigopen.bmj.com/ on May 19, 2025 at Dep tp://brigopen.bmj.com/ on May 19, 2025 at Dep , Al training, and similar technologies.	ortioned to stu	udies in the meta- a
Study or Subgroup log[Odd: Abby McCormack 2014a -0.1 Abby McCormack 2014b -0.2 Abby McCormack 2014c -0.1 Christopher Spankovich 2017 Total (95% CI) Heterogeneity: Chi² = 1.89, df = 3 (P = 0.60	s Ratio SE Weight SE Weigh	Odds Ratio ht IV, Fixed, 95% CI % 0.85 [0.75, 0.95] % 0.79 [0.70, 0.88] % 0.88 [0.70, 1.10] % 0.99 [0.66, 1.49] 0.83 [0.77, 0.89]	Odds Ratio N, Fixed, 95%	sizes reflect the relat	app.ttp://brigopen.bmj.com/ on May 19, 2025 at Dep tp://brigopen.bmj.com/ on May 19, 2025 at Dep , Al training, and similar technologies.	ortioned to stu	udies in the meta- a
Study or Subgroup log[Odd: Abby McCormack 2014a -0.1 Abby McCormack 2014b -0.2 Abby McCormack 2014c -0.1 Christopher Spankovich 2017 Total (95% CI) Heterogeneity: Chi² = 1.89, df = 3 (P = 0.60	s Ratio SE Weight SE Weigh	Odds Ratio ht IV, Fixed, 95% CI % 0.85 [0.75, 0.95] % 0.79 [0.70, 0.88] % 0.88 [0.70, 1.10] % 0.99 [0.66, 1.49] 0.83 [0.77, 0.89]	Odds Ratio N, Fixed, 95%	sizes reflect the relat	app.ttp://brigopen.bmj.com/ on May 19, 2025 at Dep tp://brigopen.bmj.com/ on May 19, 2025 at Dep , Al training, and similar technologies.	ortioned to stu	udies in the meta- a
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Study or Subgroup log[Odd: Abby McCormack 2014a -0.1 Abby McCormack 2014b -0.2 Abby McCormack 2014c -0.1 Christopher Spankovich 2017 Total (95% CI) Heterogeneity: Chi² = 1.89, df = 3 (P = 0.60	s Ratiol SE Weig 655144 0.0603033 41.2 390169 0.0582753 44.1 310283 0.1153023 11.3 -0.0101 0.2069 3.5 100.6	Odds Ratio Mt N, Fixed, 95% CI 0.85 [0.75, 0.95] 0.79 [0.70, 0.88] 0.88 [0.70, 1.10] 0.99 [0.66, 1.49] 7. 0.83 [0.77, 0.89]	Odds Ratio N, Fixed, 95%	ci	apple ttp://brigopen.bmj.com/ on May 19, 2025 at Department GEZ-LTA , Al trayning, and similar technologies.	ortioned to stu	udies in the meta- a

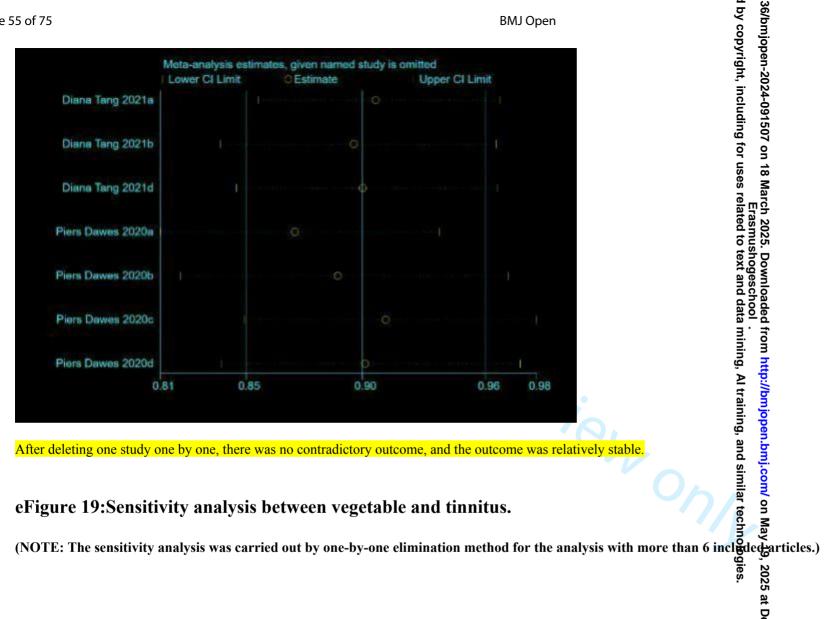
		-		Odds Ratio	Odds Ratio
Study or Subgroup	log[Odds Ratio]	SE	Weight	IV, Fixed, 95% CI	IV, Fixed, 95% CI
Abby McCormack 2014a	-0.1655144	0.0603033	41.2%	0.85 [0.75, 0.95]	
Abby McCormack 2014b	-0.2390169	0.0582753	44.1%	0.79 [0.70, 0.88]	-
Abby McCormack 2014c	-0.1310283	0.1153023	11.3%	0.88 [0.70, 1.10]	-
Christopher Spankovich 2017	-0.0101	0.2069	3.5%	0.99 [0.66, 1.49]	-
Total (95% CI)			100.0%	0.83 [0.77, 0.89]	•
Heterogeneity: Chi2 = 1.89, df =	3 (P = 0.60); P = 09	6		-	05 07 15 0
Test for overall effect: Z = 4.87 (0.5 0.7 1 1.5 2 Favours [experimental] Favours [control]

Page 52 of 75

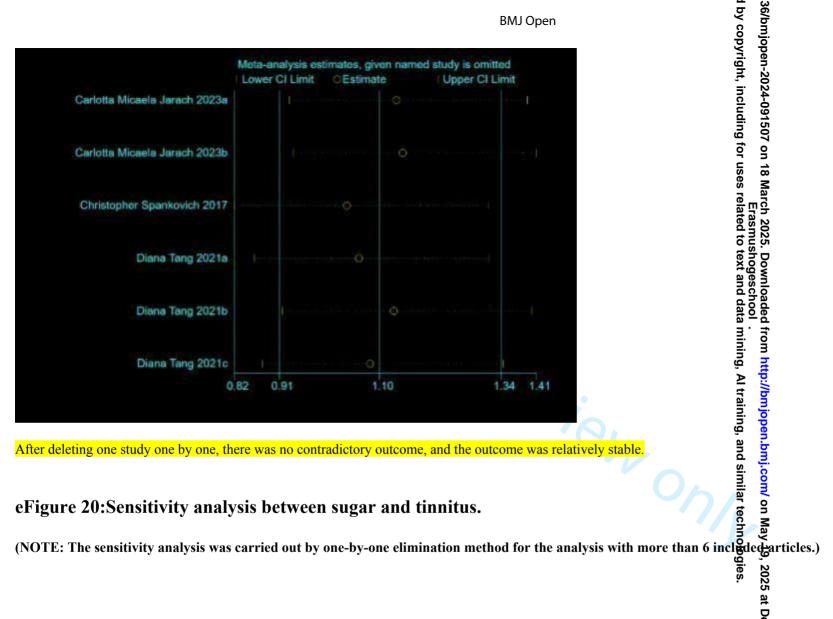
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bby McCormack 2014	4.50			41.62	on 1 for u
abby McCormack 2014a				44.21	8 Ma
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Christopher Spankovi		0.631			36/bmjopen-2024-091507 on 18 March 2025. Downlo Erasmushogesc by copyright, including for uses related to text and
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NOTE: The sensitivity analysis	was carried out by	one-by-one eliminat	tion method for the	analysis with more than	n 6 incladeda
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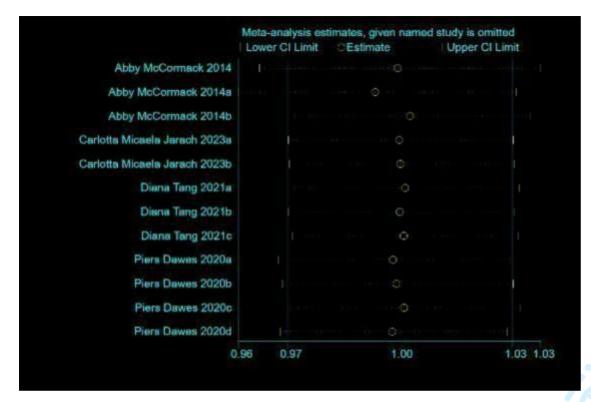




, 2025 at Department GEZ-LTA

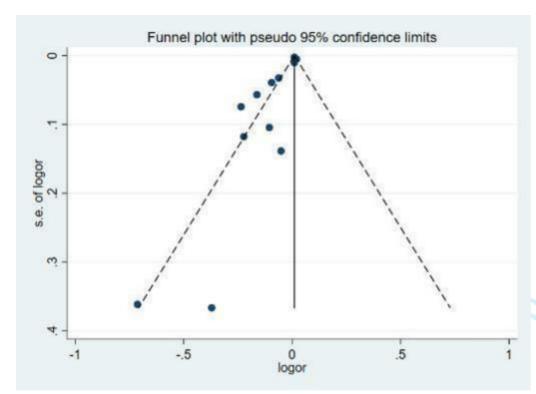


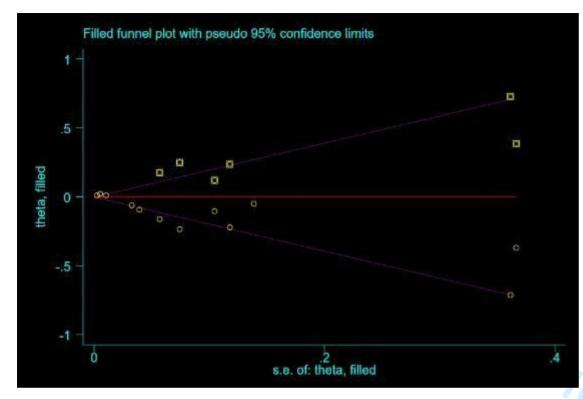
2025 at Department GEZ-LTA



After deleting one study one by one, there was no contradictory outcome, and the outcome was relatively stable.

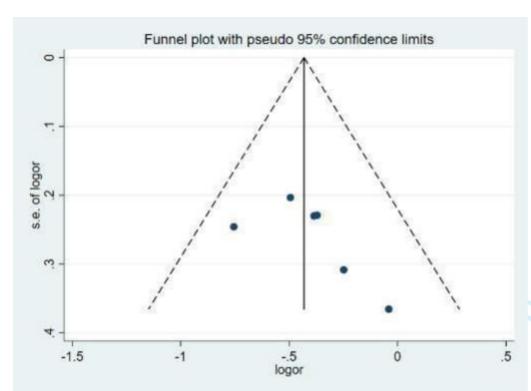
eFigure 21:Publication bias and Egger test on caffeine





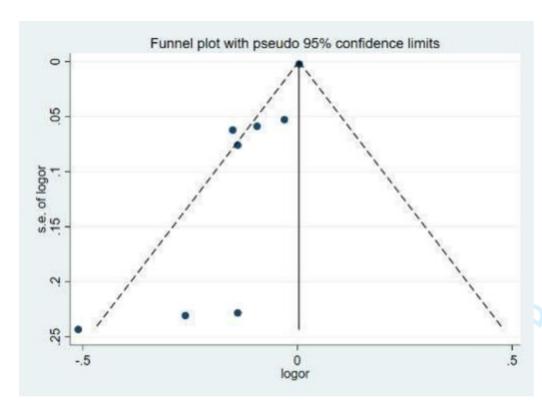
Cut and complement method tips, there was no significant publication bias.

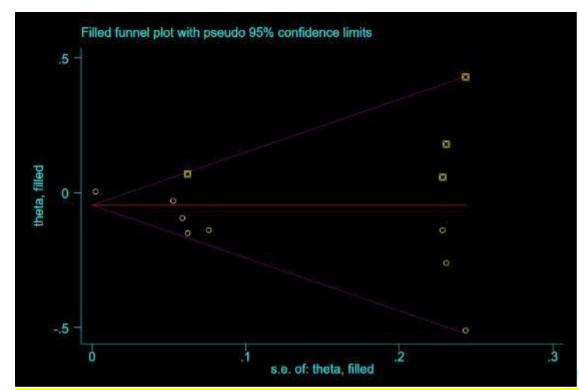
eFigure 22: Publication bias and Egger test on fruit



Egger test: Fruit p=0.205>0.05, there was no significant publication bias.

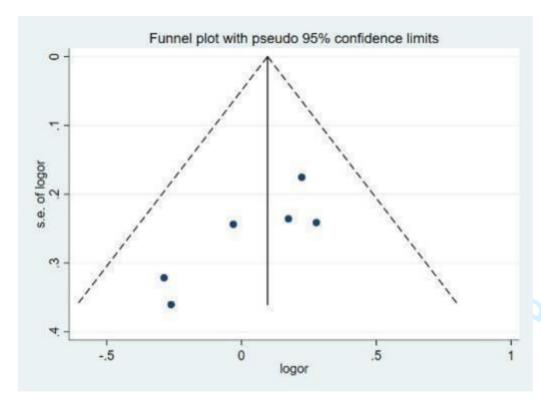
eFigure 23:Publication bias and Egger test on fiber

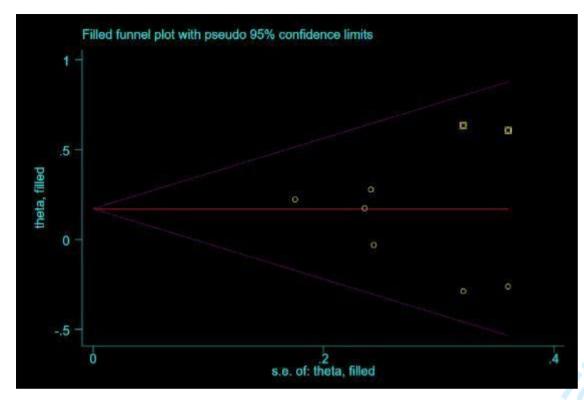




Egger test: Fruit p=0.006<0.05. Cut and complement method tips, there was no significant publication bias.

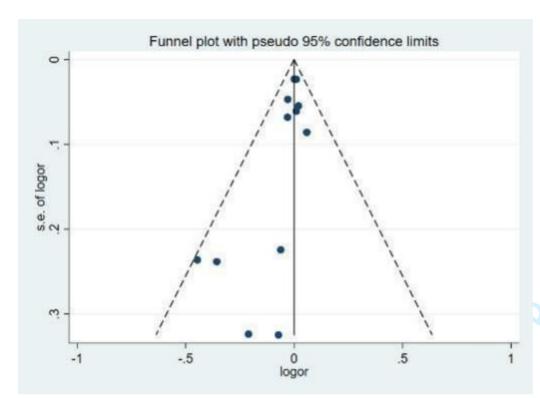
eFigure 24:Publication bias and Egger test on vegetable.

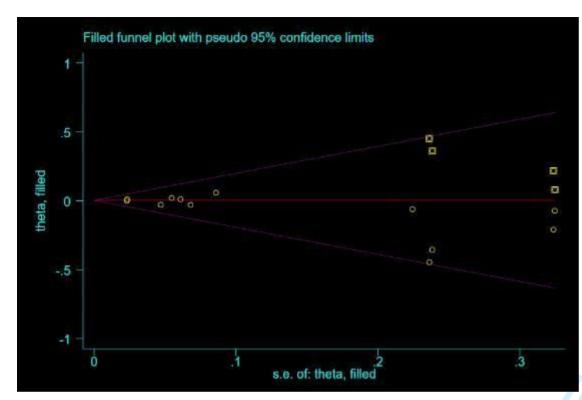




Egger test: Fruit p=0.041<0.05. Cut and complement method tips, there was no significant publication bias.

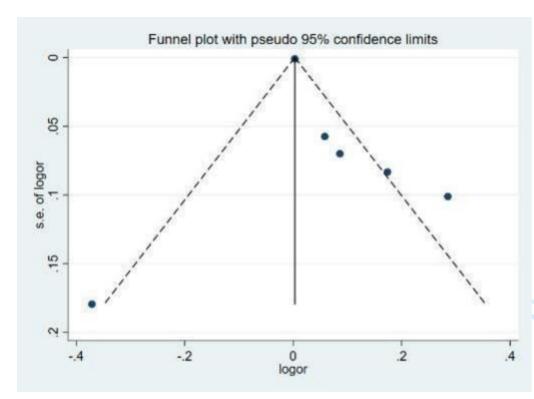
eFigure 25:Publication bias and Egger test on sugar.





Egger test: Fruit p=0.035<0.05. Cut and complement method tips, there was no significant publication bias.

eFigure 26:Publication bias and Egger test on fat.



Egger test: Fat p=0.306>0.05, there was no significant publication bias.

eTable 1. Meta-analysis of Observational Studies in Epidemiology (MOOSE) Checklist

Item No.	Recommendation Recommendation	Reported on Page No
Repo	rting of background should include	
1	% X	3-5
2	Hypothesis statement	3-5
3	Description of study outcome(s)	3-5
4	Type of exposure or intervention used	3-5
5	Hypothesis statement Description of study outcome(s) Type of exposure or intervention used Type of study designs used Study population	-
6	Study population	5
Repo	rting of search strategy should include	
7	Qualifications of searchers (eg. librarians and investigators)	6
8	Search strategy, including time period included in the synthesis and keywords	6
9	Effort to include all available studies, including contact with authors	6, 7
10	Databases and registries searched	5,6
11	Search software used, name and version, including special features used (eg, explosion)	8
12	Use of hand searching (eg, reference lists of obtained articles)	6
13	List of citations located and those excluded, including justification	6, Fig 1
14	Method of addressing articles published in languages other than English	7
15	Method of handling abstracts and unpublished studies	6, 7
16	Description of any contact with authors	-
Repo	rting of methods should include	
	p:	

9 of 75	BMJ Open BMJ Open BMJ Open Description of relevance or appropriateness of studies assembled for assessing the hypothesis to be testedding Pationals for the selection and coding of data (e.g. sound clinical principles or convenience)	
17	Description of relevance or appropriateness of studies assembled for assessing the hypothesis to be tested 6. 91.	8
18	Rationale for the selection and coding of data (eg, sound clinical principles or convenience)	7-8
19	Documentation of how data were classified and coded (eg, multiple raters, blinding and interrater reliability)	7
20	Assessment of confounding (eg. comparability of cases and controls in studies where appropriate)	7
21	Assessment of study quality, including blinding of quality assessors, stratification or regression on possible study results Assessment of heterogeneity Description of statistical methods (eg, complete description of fixed or random effects models, justification of available for the	7
22	Assessment of heterogeneity	8
23	Description of statistical methods (eg, complete description of fixed or random effects models, justification of whether the	8
	Description of statistical methods (eg, complete description of fixed or random effects models, justification of her the chosen models account for predictors of study results, dose-response models, or cumulative meta-analysis) and the detail to be replicated	
24	Provision of appropriate tables and graphics	Table 1, Fig 1
Repo		
25	Graphic summarizing individual study estimates and overall estimate	Fig 2, Table 1
26	Table giving descriptive information for each study included	eTable2
27	Results of sensitivity testing (eg, subgroup analysis)	eFig16-20
28	Indication of statistical uncertainty of findings rting of discussion should include	10,11
Repo	Results of sensitivity testing (eg, subgroup analysis) Indication of statistical uncertainty of findings rting of discussion should include	
29	Quantitative assessment of bias (eg, publication bias)	eFig21-26
30	Justification for exclusion (eg, exclusion of non-English language citations)	Fig 1
31	Assessment of quality of included studies	eTable 5
Repo	rting of conclusions should include	
32	Consideration of alternative explanations for observed results	11-19
33	Generalization of the conclusions (ie, appropriate for the data presented and within the domain of the literature ஷ்ல்iew)	11-19

			<u> </u>
34	Guidelines for future research	/righ	19-20
35	Disclosure of funding source	਼ੌਜ਼ ਤ	1
Table 2	2: Dietary risk ratio associated with tinnitus	ng for u	-091507 on 18

eTable 2: Dietary risk ratio associated with tinnitus

	1				<u> </u>	
Carlotta Micaela Jarach 2023a	scarce	butter	tinnitus	0.98	0.44 A	1.77
Carlotta Micaela Jarach 2023b	normal use or high use	butter	tinnitus	0.46	rch 2025. Erasmus elated to	0.93
Diana Tang 2021a	2nd quartile (>188.4–231.7)	carbohydrate	tinnitus	0.74	5. Downshog	1.17
Diana Tang 2021b	3rd quartile (231.8– 280.8)	carbohydrate	tinnitus	0.739	5. Downloaded	1.15
Diana Tang 2021c	4th quartile (>280.8– 577.7)	carbohydrate	tinnitus	0.55		0.9
Doh Young Lee 2018	direct	carbohydrate	tinnitus	1.001	0. 2 99 🔀	1.001
Piers Dawes 2020a	quintile 2	Carbohydrate	tinnitus	1.03	0 .2 4	1.14
Piers Dawes 2020b	quintile 3	Carbohydrate	tinnitus	0.98	0.38 8	1.11
Piers Dawes 2020c	quintile 4	Carbohydrate	tinnitus	0.99	0.36 G	1.14
Piers Dawes 2020d	quintile 5	Carbohydrate	tinnitus	0.93		1.1
Carlotta Micaela Jarach 2023a	50-100g/week	cheese	tinnitus	1.29	0.33 3	2.67
Carlotta Micaela Jarach 2023b	100+g/week	cheese	tinnitus	0.85	0 3 6 8	1.58
Abby McCormack 2014	direct	coffee	Transient tinnitus	1.020	1.@10 n 1.@10 n	1.031
Abby McCormack 2014a	direct	coffee	Persistent tinnitus	1.010	1. @ 10 n	1.020
Abby McCormack 2014b	direct	coffee	Bothersome tinnitus	1.010	0.500 2	1.031
Carlotta Micaela Jarach 2023a	2nd quartile (850- 1749mg)	coffee	tinnitus	0.49	19, 2025 blogles.	0.99
Carlotta Micaela Jarach 2023b	3rd quartile (≥1750mg)	coffee	tinnitus	0.69	0.34 at D	1.43
Jordan T Glicksman 2014a	150-299 mg/day	coffee	tinnitus	0.94	0.88	1
Jordan T Glicksman 2014b	300-449 mg/day	coffee	tinnitus	0.91	0.84	0.98
Jordan T Glicksman 2014c	450-599 mg/day	coffee	tinnitus	0.85	0.76	0.95

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Jordan T Glicksman 2014d	600+ mg/day	coffee	tinnitus	0.79	0 3 8 pen	0.91
Sang-Youp Lee 2018	Age 19–39 (Daily)	coffee	tinnitus	0.8	-2024- ht;4nc	1
Sang-Youp Lee 2018	Age 40-64 (Daily)	coffee	tinnitus	0.9	0.23 91	1.1
Sang-Youp Lee 2018	Age >65 (Daily)	coffee	tinnitus	0.95	0 4 2 507	1.24
Abby McCormack 2014	direct	dairy	Transient tinnitus	0.847	0.952 🖺	0.752
Abby McCormack 2014a	direct	dairy	Persistent tinnitus	0.787	0. § 85 &	0.704
Abby McCormack 2014b	direct	dairy	Bothersome tinnitus	0.877	1. 6 99 ar	0.699
Christopher Spankovich 2017	direct	dairy	Persistent tinnitus	0.99	0 蒙 [[] S	1.50
Carlotta Micaela Jarach 2023a	16-19	diversity	tinnitus	0.53	202 0.4 0.4	1
Carlotta Micaela Jarach 2023b	≥20	diversity	tinnitus	0.47	0.345.0	0.9
Abby McCormack 2014	direct	egg	Transient tinnitus	1.031	1. F49 8	0.926
Abby McCormack 2014a	direct	egg	Persistent tinnitus	1.149	1. 2 98 nlo	1.031
Abby McCormack 2014b	direct	egg	Bothersome tinnitus	0.901	1. 2 3 3 4 6	0.719
Carlotta Micaela Jarach 2023a	1/week	eggs	tinnitus	0.99	0.31 to	1.92
Carlotta Micaela Jarach 2023b	2+/week	eggs	tinnitus	0.54	March 2025. Downloaded from 9 Ezasmushogeschool 9 Ezasmushogeschool 9 Seletated to text and datamini	1
Christopher Spankovich 2017	direct	fat	Persistent tinnitus	0.69	0 9 49	0.99
Doh Young Lee 2018	direct	fat	tinnitus	1.003	1. 📆 1 💃	1.005
Piers Dawes 2020a	quintile 2	fat	tinnitus	1.06	09/5	1.19
Piers Dawes 2020b	quintile 3	fat	tinnitus	1.09	0 .3 5 💆	1.25
Piers Dawes 2020c	quintile 4	fat	tinnitus	1.19	1.491	1.40
Piers Dawes 2020d	quintile 5	fat	tinnitus	1.33	1.99 💆	1.62
Diana Tang 2021a	2nd quartile (>17.8– 23.8)	fiber	tinnitus	0.6	jopen.bmj.com/ o niag, an desimitar	0.96
Diana Tang 2021b	3rd quartile (>23.8– 30.6)	fiber	tinnitus	0.87	imitar technologies	1.37
Diana Tang 2021d	4th quartile (>30.6– 89.3)	fiber	tinnitus	0.77	010g es. 999 at 0.999	1.21
Doh Young Lee 2018	direct	fiber	tinnitus	1.004	0.999 م	1.008
Piers Dawes 2020a	quintile 2	fiber	tinnitus	0.97	0.87 D	1.07
Piers Dawes 2020b	quintile 3	fiber	tinnitus	0.91	0.81 a	1.02
Piers Dawes 2020c	quintile 4	fiber	tinnitus	0.86	0.76 mm 0.75 mm	0.97
Piers Dawes 2020d	quintile 5	fiber	tinnitus	0.87	0.75	1.01

			BMJ Open		36/bmjopen	
Abby McCormack 2014	direct	fish	Transient tinnitus	0.980	0. 2 ≨0 en	1.020
Abby McCormack 2014a	direct	fish	Persistent tinnitus	0.910	0. \$ 70 🖄	0.940
Abby McCormack 2014b	direct	fish	Bothersome tinnitus	1.080	0.890	1.160
Carlotta Micaela Jarach 2023a	300g/week	fish	tinnitus	1.19	091507 00ing 1	2.38
Carlotta Micaela Jarach 2023b	≥450g/week	fish	tinnitus	0.75	0.41 55	1.4
Carlotta Micaela Jarach 2023a	900-1050g/week	fruit	tinnitus	0.96	0.97 9	1.97
Carlotta Micaela Jarach 2023b	≥1200g/week	fruit	tinnitus	0.78	0 .5 3 18 1	1.44
Christopher Spankovich 2017	direct	fruit	Persistent tinnitus	0.61	0 <u>.3</u> 1 Mar	0.91
Diana Tang 2021a	2nd quartile (>3.6– 6.2)	fruit	tinnitus	0.47	ch 202 Erasm lated i	0.76
Diana Tang 2021b	3rd quartile (>6.2– 9.7)	fruit	tinnitus	0.68	5. Doviushog	1.06
Diana Tang 2021d	4th quartile (>9.7– 43.9)	fruit	tinnitus	0.69	18 March 2025. Downloaded	1.08
Carlotta Micaela Jarach 2023a	scarce	margarine	tinnitus	1.35	0 a S a	7.43
Carlotta Micaela Jarach 2023b	normal use or high use	margarine	tinnitus	1.4	from http://pip.75	9.98
Carlotta Micaela Jarach 2023a	300g/week	meat	tinnitus	1.49	0 .7 5 =	2.94
Carlotta Micaela Jarach 2023b	≥450g/week	meat	tinnitus	0.97	0. 5 1 🕏	1.85
Christopher Spankovich 2017	direct	meat	Persistent tinnitus	1.01	0. 3 .2 😽	1.65
Carlotta Micaela Jarach 2023a	2nt quartile (1-6 cops/week)	milk	tinnitus	0.68	mjopen.bmj.com	1.52
Carlotta Micaela Jarach 2023b	3rt quartile (7+ cops/week)	milk	tinnitus	0.85	nj.com/on 0.mila@1.001	1.55
Doh Young Lee 2018	direct	protein	tinnitus	1.002	1.001 9	1.004
Piers Dawes 2020a	quintile 2	protein	tinnitus	1.02	0.\$42 €	1.14
Piers Dawes 2020b	quintile 3	protein	tinnitus	1.01	0 9 9 19	1.13
Piers Dawes 2020c	quintile 4	protein	tinnitus	0.97	0 9 5 2	1.11
Piers Dawes 2020d	quintile 5	protein	tinnitus	1.06	0.59 0.59	1.26
Abby McCormack 2014	direct	sugar	Transient tinnitus	1.000	0.952	1.042
Abby McCormack 2014a	direct	sugar	Persistent tinnitus	1.010	0.971 த	1.064
Abby McCormack 2014b	direct	sugar	Bothersome tinnitus	0.971	0.885 artime	1.064

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Carlotta Micaela Jarach 2023a	2nt quartile (1-7 spoon/week)	sugar	tinnitus	0.93	pen-2024-091507 on yright, incfuding∑or	1.75
Carlotta Micaela Jarach 2023b	3rt quartile (8+ spoon/week)	sugar	tinnitus	0.81	24-091: 0 udi	1.53
Diana Tang 2021a	2nd quartile (>91.0– 120.1)	sugar	tinnitus	0.64	24-091507 on 18 M	1.01
Diana Tang 2021b	3rd quartile (>120.1– 154.0)	sugar	tinnitus	0.94	18 Mai uses r	1.47
Diana Tang 2021c	4th quartile (>154.0– 350.8)	sugar	tinnitus	0.7	Aarch 2025. Downloa Erasmushegesch s related to text and	1.12
Piers Dawes 2020a	quintile 2	sugar	tinnitus	1.02	0.325.5	1.14
Piers Dawes 2020b	quintile 3	sugar	tinnitus	1.01	0 % 6 0	1.13
Piers Dawes 2020c	quintile 4	sugar	tinnitus	0.97	0.33.65.0	1.11
Piers Dawes 2020d	quintile 5	sugar	tinnitus	1.06	Oga Oga Oga	1.26
Christopher Spankovich 2017	direct	variety	Persistent tinnitus	0.95	Oataon	1.5
Carlotta Micaela Jarach 2023a	900-1050g/week	vegetable	tinnitus	0.77	038 6	1.56
Carlotta Micaela Jarach 2023b	≥1200g/week	vegetable	tinnitus	0.75	(654 ₹	1.41
Christopher Spankovich 2017	direct	vegetable	Persistent tinnitus	1.25	(<u>A</u>)	1.79
Diana Tang 2021a	2nd quartile (>7.2– 9.7)	vegetable	tinnitus	1.32	Agtraxaning, and	2.11
Diana Tang 2021b	3rd quartile (>9.7– 12.3)	vegetable	tinnitus	0.97	0.50	1.56
Diana Tang 2021c	4th quartile (>12.3– 54.5)	vegetable	tinnitus	1.19	0 3 5 3 3 3 3 3 3 3 3 3 3	1.89
Abby McCormack 2014	direct	vegetable and fruit	Transient tinnitus	1.000	1.0000	1.010
Abby McCormack 2014a	direct	vegetable and fruit	Persistent tinnitus	1.010	ا فِي 1.0000	1.010
Abby McCormack 2014b	direct	vegetable and fruit	Bothersome tinnitus	1.010	1. 6 00 3	1.020
Carlotta Micaela Jarach 2023a	>1 liter/per day	water	tinnitus	0.84		1.65
Doh Young Lee 2018	direct	water	tinnitus	1.003	0.992 5	1.014

Table 3. Evalua	tion of Risl	c of Bias U s	sing Nev	vcastle-(Scale (I	NOS) fo	r Observ	š a	es
Study	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Tasm 2021	Total
Carlotta Micaela Jarach 2023	*	*	*	*	*	*	*	*	rch 2825. Downloaded from http://bmjopen Erasmushogeschool elatedto text and data mining, Al training,	8
Diana Tang 2021	*	*	*		*	*	*	*	load scho nd da	8
Milena Tomanic 2020	*	*	*		0,		*		led from	4
Piers Dawes 2020	*	*	*		*	*	*		n ht	6
Sang-Yeon Lee 2019	*	*	*		*	*	*		tp://bn Al tra	6
Doh Young Lee 2018	*	*	*		*	*	*		njopen ining,	6
Sang-Youp Lee 2018	*	*	*		*	*	*		.bmj.c	6
Christopher Spankovich 2017	*	*	*		*	*	*	0)	n.bmj.com/ on May 19, 2025 and similar technologies.	6
Abby McCormack 2014	*	*	*		*	*	*		May 1	6
Jordan T Glicksman 2014	*	*	*		*	*	*		9, 202 * ogies.	7

eTable 4. Literature screening process

75 of 75	BMJ Open	36/bmjo _l
eTable 4. Literature screening process		36/bmjopen-2024-09150g of the distribution of
Title	Author	Include
The Role of Diet in Tinnitus Onset: A Hospital-Based Case-Control Study from Italy.	Carlotta Micaela Jarach 2023	18 Warch 2025. ⊞ Eraşmus use≼related to t
Associations between intake of dietary flavonoids and the 10-year incidence of tinnitus in older adults.	Diana Tang 2022	h 2025. Trasmus ated to
Dietary Fibre Intake and the 10-Year Incidence of Tinnitus in Older Adults.	Diana Tang 2021	. Downlo shogesc text and
Relationship Between Diet, Tinnitus, and Hearing Difficulties.	Piers Dawes 2020	oaded Speol d'Arata
Association of Chocolate Consumption with Hearing Loss and Tinnitus in Middle-Aged People Based on the Korean National Health and Nutrition Examination Survey 2012-2013.	Sang-Yeon Lee 2019	d from http://bm.jopec.bmj.com/ on May 19,2025 at Department 日 日 日 日 日 日 日 日 日 日 日 日 日 日 日 日 日 日 日
Relationship Between Diet and Tinnitus: Korea National Health and Nutrition Examination Survey.	Doh Young Lee 2018	o://bonjo Al traini
Association of Coffee Consumption with Hearing and Tinnitus Based on a National Population-Based Survey	Sang-Youp Lee 2018	pegan Egyand
Relationship between dietary quality, tinnitus and hearing level: data from the national health and nutrition examination survey, 1999-2002.	Christopher Spankovich 2017	j.com/ E Isimmilar
Association of dietary factors with presence and severity of tinnitus in a middle-aged UK population.	Abby McCormack 2014	onoMay E te≿hno
A prospective study of caffeine intake and risk of incident tinnitus	Jordan T. Glicksman 2014	19 <u>,2</u> 02 E blogites.
The effect of MemoVigor 2 on recent-onset idiopathic tinnitus: a randomized double-blind placebo-controlled clinical trial.	Dimitrios G Balatsouras 2024	5 at Der N
The effects of dietary and physical activity interventions on tinnitus symptoms: An RCT.	Ümüş Özbey-Yücel 2023	oartmen N

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Effectiveness of Tinnitan Duo in Subjective Tinnitus with Emotional Affectation: A Prospective, Interventional Study.	Jennifer Knäpper 2023	open-202 Nayright, ii
Hyperlipidemia and its relation with tinnitus: Cross-sectional approach.	A Musleh 2022	in objective in the second se
Diet Quality and the Risk of Impaired Speech Reception Threshold in Noise: The UK Biobank cohort	Humberto Yévenes-Briones 2022	24-091507 on nectuding for
The effect of caffeine on tinnitus: Randomized triple-blind placebo- controlled clinical trial.	Alleluia Lima Losno Ledesma 2021	n 18 Ma Nor uses i
The effects of diet and physical activity induced weight loss on the severity of tinnitus and quality of life: A randomized controlled trial.	Ümüş Özbey-Yücel 2021	rch 202 Erasm elated
Dietary Factors and Tinnitus among Adolescents.	Milena Tomanic 2020	6 40 C
Restriction of salt, caffeine and alcohol intake for the treatment of Ménière's disease or syndrome.	Kiran Hussain 2018	ownloa ogesch ext and
The effect of supplemental dietary taurine on tinnitus and auditory discrimination in an animal model.	Thomas J Brozoski 2010	aded fro 100/. data mi
Low energy diet and intracranial pressure in women with idiopathic intracranial hypertension: prospective cohort study.	Alexandra J Sinclair 2010	ining, Al
Caffeine abstinence: an ineffective and potentially distressing tinnitus therapy.	Lindsay St Claire 2010	//bmjopen
The role of endogenous Antisecretory Factor (AF) in the treatment of Meniere's Disease: A two-year follow-up study. Preliminary results.	Pasquale Viola 2020	and s
Caffeine intake and Meniere's disease: Is there relationship?	Inés Sánchez-Seller 2018	<u>s</u> Nog
Tinnitus features according to caffeine consumption.	Ricardo Rodrigues Figueiredo 2021	cgm/ op May 19, 202 Zimilar technologies.
The Influence of Diet on Tinnitus Severity: Results of a Large-Scale, Online Survey	Steven C. Marcrum 2022	nologie

BMJ Open

Association of fifteen common dietary factors with tinnitus: a systematic review and meta-analysis of observational studies

Journal:	BMJ Open			
Manuscript ID	bmjopen-2024-091507.R3			
Article Type:	Original research			
Date Submitted by the Author:	07-Feb-2025			
Complete List of Authors:	Zhang, Mengni; Chengdu University of Traditional Chinese Medicine, Wang, Xiaocui; Hospital of Chengdu University of Traditional Chinese Medicine Zhang, Shipeng; Hospital of Chengdu University of Traditional Chinese Medicine, He, Xinyi; Chengdu University of Traditional Chinese Medicine Chen, Xi; Hospital of Chengdu University of Traditional Chinese Medicine Wang, Lu; Hospital of Chengdu University of Traditional Chinese Medicine Fu, Li; Hospital of Chengdu University of Traditional Chinese Medicine Fu, Qinwei; Hospital of Chengdu University of Traditional Chinese Medicine Fu, Qinwei; Hospital of Chengdu University of Traditional Chinese Medicine Jiang, yanjie; Nanjing University of Chinese Medicine Li, Xinrong; Hospital of Chengdu University of Traditional Chinese Medicine Zhang, Qinxiu; Chengdu University of Traditional Chinese Medicine, Hospital of Chengdu University of Traditional Chinese Medicine; Chengdu University of Traditional Chinese Medicine; Chengdu University of Traditional Chinese Medicine, School of Medical and Life Sciences			
Primary Subject Heading :	Ear, nose and throat/otolaryngology			
Secondary Subject Heading:	Nutrition and metabolism			
Keywords:	OTOLARYNGOLOGY, NUTRITION & DIETETICS, Meta-Analysis, Neurotology < OTOLARYNGOLOGY			

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34 35		
36	13	approach.
37	4.4	Data sarrass The Dub Med Fushers Web of Science and Cochanne
38 39	14	Data sources The PubMed, Embase, Web of Science, and Cochrane
40 41	15	Library databases were searched from their inception to May 25, 2024.
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43	16	Eligibility criteria for selecting studies We included observational
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46	17	studies from peer-reviewed English-language journals that examined
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48 49	18	tinnitus presence or severity in adults aged 18 years or older, including
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51	19	associated prevalence estimates.
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54	20	Data extraction and synthesis Data extraction was independently
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56 57	21	conducted by two evaluators, who assessed research bias using the Agency
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59	22	for Newcastle-Ottawa Scale (NOS) and applied evidence classification
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 findings.

criteria for aggregate grade strength assessment. This study adhered to the guidelines of the Preferred Reporting Project (PRISMA) and Meta-Analysis of Epidemiological Observational Studies (MOOSE), as well as the PROSPERO Registry protocols. A mixed-effects model combined maximum adjusted estimates, with heterogeneity measured using the I² statistic. Sensitivity analysis validated the robustness of the analysis, and publication bias was assessed qualitatively and quantitatively. **Results** A total of 10 retrospective studies were identified and included in this analysis, with the last eight studies incorporated into the meta-analysis. Fifteen dietary factors were examined. Fruit intake, dietary fiber, caffeine, and dairy product consumption were negatively correlated with tinnitus incidence (OR = 0.649, [95% CI 0.532, 0.793], p<0.0001), (OR = 0.918, [95% CI 0.851, 0.990], p = 0.03), (OR = 0.898, [95% CI 0.862, 0.935], p

Conclusions This systematic review and meta-analysis suggest a link between particular dietary elements and a lower incidence of tinnitus.

<0.00001), (OR = 0.827, [95% CI, 0.766 to 0.892], p <0.00001),

respectively. A sensitivity analysis confirmed the robustness of the

- **PROSPERO registration number** CRD42023493856
- **Keywords:** Diet; Tinnitus; Food intake; Nutrition; Odds ratio

STRENGTHS AND LIMITATIONS OF THIS STUDY

- This study conducted a thorough literature screening, assessed the quality of the literature based on international standards, and excluded articles with a high risk of bias.
- This review involves a large population base, improving its representation of fundamental population characteristics and ensuring relatively reliable outcomes.
- There was minimal heterogeneity among the studies regarding the main observations, ensuring the solidity of the findings.
- The relatively small number of included articles may have led to certain conventionally accepted beneficial dietary factors (such as vegetables and eggs) not demonstrating significant differences. In addition, owing to the limited data in the original literature, a dose-effect meta-analysis cannot be supported.
- The majority of the included articles were cross-sectional studies, underscoring the necessity for further cohort studies or Mendelian randomization studies to investigate causal relationships and provide additional clinical evidence for the dietary prevention of tinnitus.

Introduction

 Tinnitus, characterized by perceived sounds such as buzzing, cicadas, or electric currents, occurs without external auditory stimuli ¹. It is associated with distress, depression, anxiety, stress, and, in severe cases, suicide,

significantly affecting overall quality of life² ³. Recent epidemiological data suggest a global pooled prevalence of about 14.4% in adults and 13.6% in children and adolescents⁴. The notable prevalence of tinnitus and its substantial impact on life and mental well-being have increasingly become significant medical and societal concerns⁵. The origins of tinnitus remain elusive and involve a range of factors. Some researchers have suggested neural dysfunction or circulatory issues in the inner ear, abnormal neuronal activity in central auditory pathways, and irregular activity in nonauditory brain regions such as the anterior insula, anterior cingulate cortex, and thalamus⁶. In clinical practice, treatments for tinnitus management include psychological counseling, cognitive-behavioral therapy, tinnitus retraining therapy, sound therapy, surgery, pharmacological interventions, and nonpharmacological interventions electrical stimulation, repetitive transcranial magnetic stimulation, nerve block, bimodal neuromodulation, tinnitus retraining therapy, etc.), as well as hearing aids and cochlear implants for patients with relevant hearing loss^{7 8}. Owing to an incomplete understanding of central neuropathological mechanisms, no single treatment universally meets the needs of all patients⁹ 10. Diet can have a significant impact on tinnitus, but it remains uncertain which specific foods worsen or relieve tinnitus symptoms. Diet is an uncertain factor for tinnitus, as mentioned in the James Lind Alliance

 prioritization statement. Optimizing nutritional intake is an essential part of multidimensional efforts to prevent and treat chronic diseases. In recent years, there has been an increase in interest and need for nutritional treatment programs for tinnitus¹¹, as evidenced by various populationbased studies found in lately publications¹²⁻¹⁵. A population study investigating the correlation between diet and tinnitus among UK adults revealed a decrease in tinnitus incidence with increased fruit and vegetable consumption. Conversely, avoiding dairy was linked to a greater risk of tinnitus. On the other hand, abstaining from eggs, adding fish to the diet, and consuming caffeinated beverages are suggested to potentially lower the risk of tinnitus ². Another study in British adults revealed that greater fat intake was associated with a greater likelihood of experiencing tinnitus¹⁶. Similarly, Lee and Kim identified risk factors for tinnitus, including low water, protein, riboflavin, and niacin intake, although this was unrelated to fruit and vegetable consumption¹⁷. It is thought that the intake of high-quality nutrients through food can have a positive effect on the hearing system by improving blood flow to the cochlea, reducing oxidative damage and reducing inflammation. In contrast, high saturated fat intake may increase the risk of tinnitus through cardiovascular pathways¹¹ 16. Tang et al. 18 reported that inadequate fruit fiber (<3.6 g/day) and grain fiber (<4.2 g/day) intake were linked to a 65% and 54% increased risk of developing tinnitus over the next decade, respectively. Conflicting

 results have hindered researchers' ability to understand the potential benefits of diet; hence, a systematic review on the relationship between diet and tinnitus is needed.

To date, there has not been a comprehensive examination through

To date, there has not been a comprehensive examination through systematic reviews or meta-analyses regarding the link between typical dietary patterns and tinnitus. Our objective was to systematically explore this association while accounting for potential confounding variables. This study aimed to provide clinical evidence to inform the development of dietary prevention approaches for tinnitus.

Method

According to the guidelines of the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA), a set of evidence-based standards for the research quality of systematic reviews, which apply to published reviews of literature that contain primary data sources and aim to improve the scientific rigor of systematic reviews¹⁹, the protocol for this study was appropriately registered on PROSPERO under the registration number CRD42023493856. Additionally, our reporting is guided by the Meta-analysis of Observational Studies in Epidemiology (MOOSE) standards for epidemiological observational studies, which were developed by a group of experts to improve the quality and transparency of meta-analysis and systematic evaluation of observational studies, contributing to

the scientific validity and credibility of such studies, as referenced ²⁰.

134 Supplemental eTable 1 contains the MOOSE listings, whereas

Supplemental 2 outlines the PRISMA instructions.

Search Strategy

 We developed an inclusive search strategy covering diet-related and tinnitus-related subjects to capture pertinent literature from the PubMed, Embase, Web of Science, and Cochrane Library databases. The research design was limited to systematic evaluation. There were no language restrictions imposed on the search, and we considered articles published before May 25, 2024. We used special translation software for publications in unknown languages. The search strategy was designed to identify studies linking tinnitus and diet, and two specific terms, 'Tinnitus' and 'Diet', from the Medical Subject Headings (MeSH) Major Topic were identified. The databases were systematically explored via a blend of MeSH terms, keywords, and various text word variations related to diet, following the guidance outlined by the Scottish Intercollegiate Guidelines Network: ((tinnitus OR Ringing-Buzzing) AND (diet OR food OR water OR milk OR fish OR fruit OR vegetable OR fiber OR sugar OR meat OR margarine OR fat OR egg OR variety OR caffeine OR carbohydrate OR protein). The search strategy for each database is described in Supplemental Search Strategy. The

screening process is depicted in Figure 1.

 The following inclusion criteria were applied: (1) inclusion of cohort, case-control, or cross-sectional studies; (2) inclusion of all individuals in the study population; (3) consideration of various dietary intakes; and (4) investigation of tinnitus as a study outcome provided effect sizes or other data on the association between dietary intake and tinnitus as an outcome. The exclusion criteria were as follows: (1) studies involving therapeutic interventions; (2) randomized controlled trials, animal experiments, cell studies, case reports, literature, and incomplete or invalid sources, and the original literature lacked sufficient data to calculate the risk ratio for tinnitus (some publications do not report effect sizes but instead allow the raw data to be used to calculate them. In these cases, RevMan (version 5.3) was used to calculate the OR).

Data collection

In **Table 1,** data compilation was conducted by two reviewers (SZ, MZ), including authors' names, participant counts, age spans, survey/diagnosis specifics, and information on food and tinnitus. Given that dietary intake is a continuous variable, some researchers have typically performed stratified comparisons on the basis of regional intake standards and researchers' characteristics. This strategy aimed to explore the impact of varying levels of increased intake on tinnitus incidence. For most continuous variables associated with food intake, adjusted OR values were assimilated in the meta-analysis when stratified according to dose intake,

odds ratios (ORs) are provided in Supplemental eTable 2 .
the singular adjusted OR value was integrated. Further insights into the
with the exclusion of the reference group. In cases of direct comparison,

Literature quality evaluation

The assessment of individual study quality was conducted by two reviewers (SZ and MZ) via a modified version of the Newcastle-Ottawa Scale. Previous studies were categorized as having a high (<5 stars),



Table 1: Basic information to be incorporated into the article.

Author	Total	Age	Time frame	Data from	Study design	Diet recording method	Disease diagnosis	Type of diet
Jarach 2023	383	40–65	2016–2019	The Mario Negri Institute in Milan (Italy), Monza e Brianza, Italy	case control	Self-designed questionnaire	Interviewer administered a questionnaire and the Italian-validated version of the tinnitus handicap inventory	coffee, eggs, butter, meat, fish, cheese, fruit, vegetable, varied diet, dairy, milk
Tang 2022	1217	>50	1997 - 2009	Blue Mountains Hearing Study	cohort	Semiquantitative food frequency questionnaire, FFQ	Audiologist administered questionnaire	dietary flavonoids
Tang 2021	1730	>50	1997–2009	Blue Mountains Hearing Study	cohort	Semiquantitative food frequency questionnaire, FFQ	Audiologist administered questionnaire	carbohydrate, sugar, fiber, fruit, vegetable
Dawes 2020	34576	30–69	2006–2010	UK Biobank resource (Collins 2012).	cross-sectional	Dietary assessment was based on the Oxford Web-Q	An epidemiologic method of hearing investigation	fiber, fat, sugar
Lee 2019	3575	40–64	2012–2013	The sixth Korea National Health and Nutrition Examination Survey (KNHANES)	cross-sectional	Food-frequency questionnaire (FFQ)	Self-designed questionnaire	chocolate
Lee 2018	7621	40–80	2013–2015	The sixth Korea National Health and Nutrition Examination Survey (KNHANES)	cross-sectional	Diet was assessed with a semiquantitative food-frequency questionnaire	Self-designed questionnaire	water, protein, fat, carbohydrate, fiber
Lee 2018	13448	>19	2009 - 2012	The sixth Korea National Health and Nutrition Examination Survey	cross-sectional	Food-frequency questionnaire (FFQ)	Self-designed questionnaire	coffee
Spankovich 2017	2176	20–69	1999–2002	NHANES	cross-sectional	Dietary recall interviews were conducted during 1999–2002 NHANES MEC evaluations.	Self-designed questionnaire	fat, fruit, vegetable, meat, varied diet
McCormack 2014	171722	40–69	2006–2010	UK Biobank resource (Collins 2012).	cross-sectional	The UK Biobank touchscreen questionnaire	Self-designed questionnaire	fruit, vegetable, fish, egg, sugar, coffee, dairy
Glicksman 2014	65085	30– 44(regis tered)	1991–2009	The Nurses' Health Study II	cross-sectional	Extensively validated semiquantitative food frequency questionnaires	Self-designed questionnaire	coffee

moderate (5–7 stars), or low (≥8 stars) risk of bias (see eTable 3 in the
 Supplement).

Statistical analysis

 Data analysis was performed via RevMan (version 5.3) and Stata (version 15.0). Mixed-effect models were utilized to aggregate maximally covariate-adjusted odds ratios (ORs) across all studies. In current practice, odds ratios (ORs), relative risks (RRs), and hazard ratios (HRs) are about equal when events occur infrequently. For this situation, it is acceptable to include OR, RR, and HR in the same meta-analysis. In cases where the P value of the Q test was <0.10 or the I² statistic exceeded 50%, we conducted an assessment to determine significant interstudy heterogeneity. For observational studies, maximally covariate-adjusted estimates were strongly prioritized. If a study employed an analytical method incongruent with synthesis for the majority of other studies, we either converted the effect estimate to the appropriate combined ratio or excluded the study from the meta-analysis. In cases of considerable heterogeneity in the analysis with significant differences, meta-regression was used to explore the source of heterogeneity (please note that meta-regression was considered when the data included in the analysis were greater than 10). We visually assessed the asymmetry of the funnel plot and used Egger's bias to detect possible publication bias, with estimation of missing studies conducted via

 eMethods if publication bias was suspected (please note that publication bias analysis was considered when the data included in the analysis were greater than 6). Moreover, we conducted a sensitivity analysis of the pooled results employing a one-by-one exclusion method.

Patient and public involvement

Patients and/or the public were not involved in the design, conduct, reporting, or dissemination plans of this research.

the prevalence of tinnitus.

Results

The literature screening process is shown in **Supplemental eTable 4**. Ten articles were found in the search² ¹⁶⁻¹⁸ ²¹⁻²⁶. Among these, two articles delved into individual dietary factors, namely, chocolate ²³ and flavonoids ²², which were not investigated in other studies. While these two articles were included in the narrative review, they were excluded from the meta-analysis. The remaining eight articles composed the dataset for the meta-analysis.

Fifteen common dietary factors were analyzed, and dietary sources were assessed via validated nutrition/diet questionnaires. The combined findings revealed that four diets (caffeine, fruit, dietary fiber, and dairy products) were negatively associated with the incidence of tinnitus; that is, the higher the intake of caffeine, fruit, dietary fiber, and dairy products was, the lower

A meta-analysis of dietary factors

The meta-analysis included eight studies with a total of 301,533 people and analyzed 15 dietary factors, as shown in Figure 2: carbohydrates (2/8, Supplemental eFigure 1), caffeine (4/8, Supplemental eFigure 2), varied diets (2/8, Supplemental eFigure 3), eggs (2/8, Supplemental eFigure 4), fruits (3/9, Supplemental eFigure 5), fibers (2/8, Supplemental eFigure 6), fat (3/8, Supplemental eFigure 7), margarine (2/8, Supplemental eFigure 8), meat (2/8, Supplemental eFigure 9), sugar (4/8, Supplemental eFigure 10), protein (2/8, Supplemental eFigure 11), fish (3/8, Supplemental eFigure 12), vegetables (4/8, Supplemental eFigure 13), water (3/8, Supplemental eFigure 14), and dairy (2/8, Supplemental eFigure 15). The summary results are depicted in Figure 2. The intake of dairy products, fruits, dietary fiber, and caffeine was negatively correlated with the prevalence of tinnitus: 0.827 for dairy [95%] CI 0.766–0.892], $I^2 = 0\%$, p < 0.00001; 0.649 for fruit [95% CI 0.532– [0.793], $I^2 = 0\%$, p < [0.0001]; 0.918 for fiber [95% CI [0.851-0.990], $I^2 = [95\%]$ 63%, p = 0.03; and 0.898 for caffeine [95% CI 0.862–0.935], $I^2 = 23\%$, p < 0.003. Protein intake increased the risk of tinnitus (OR = 1.002 [95% CI 1.001-1.004], $I^2 = 0\%$, p = 0.009). No associations were found between other dietary factors and tinnitus.

250 Sensitivity analysis

We conducted sensitivity analyses for various dietary intakes on the basis of predefined analysis criteria (requiring data from the included articles to exceed 6). Contradictory outcomes were noted in the aggregated results for caffeine (refer to Supplemental eFigure 16), with the analysis attributing these contradictions to data within the same article (Abby McCormack 2014). Sequential exclusion of fruit (refer to Supplemental eFigure 17) and dietary fiber (refer to Supplemental eFigure 18) maintained the statistical significance of the combined odds ratio. Successive exclusion of summary results for vegetables (refer to Supplemental eFigure 19) and sugar (refer to Supplemental eFigure 20) revealed no contradictory outcomes in the combined odds ratio, thus ensuring the robustness of the meta-analysis results. The comprehensive sensitivity analysis revealed the relative robustness of the meta-analysis results, confirming the associations of fruit and dietary fiber intake with the prevalence of tinnitus. No significant associations between other dietary intakes and tinnitus were found.

Publication bias

The funnel plot and Egger test findings for caffeine, fruit, vegetables, diet, sugar, and fat indicated the presence of publication bias (**Supplemental** eFigure 21 – 26). We performed a supplementary analysis using the shear compensation method, which yielded consistent results that suggest that publication bias did not impact the main outcome.

Discussion

In this systematic review and meta-analysis involving eight observational studies (comprising a total of 301,533 participants), we discovered that increased dietary consumption of fruit, dietary fiber, dairy products, and caffeine was associated with a reduced occurrence of tinnitus. These reductions were 35.1% (20.7%–46.8%) for fruit intake, 9.2% (1%–14.9%) for dietary fiber, 17.3% (10.8%–23.4%) for dairy products, and 10.2% (6.5%–13.8%) for caffeine intake. These results were consistently supported by the sensitivity analysis. The association between caffeine intake and tinnitus remains contentious. Our findings indicate that caffeine has a positive effect on tinnitus incidence. Some suggest that caffeine might effectively decrease tinnitus incidence, possibly because of its anxiety-reducing effects. Conversely, some scholars argue that individuals with tinnitus often experience insomnia, in which caffeine consumption could worsen, thus exacerbating tinnitus symptoms. Recent observational studies ²⁷ ²⁸ have revealed no link between caffeine consumption and depression or anxiety levels. Furthermore, additional dose analysis revealed a J-pattern association between caffeine intake and psychiatric disorders, with about 2–3 cups per day associated with decreased risk 29. Caffeine, which acts as a nonselective adenosine receptor antagonist, can mitigate anxiety when it is

 ingested at a daily dose of 10 mg/kg ³⁰. Genetic analysis also suggested a correlation between caffeine consumption and reduced tinnitus incidence ³¹. This effect is achieved through adenosine receptor blockade, dopamine release promotion, acetylcholinesterase activity inhibition, and sympathetic nerve stimulation.

The results of most studies ¹⁶ ¹⁸ ²⁵ ³² showed that dietary fiber and fruit intake have a positive impact on reducing the occurrence of tinnitus, and the findings of our meta-analysis clarify this reliably and comprehensively by integrating and analyzing the results of all relevant studies. Some scholars have proposed that dietary fiber is associated with increased insulin sensitivity³³. Studies indicate that hyperinsulinemia resulting from low insulin sensitivity could disturb the inner ear environment, potentially increasing tinnitus risk ³⁴ ³⁵. Conversely, research suggests that fiber and dairy products might enhance blood vessel function ³⁶, a factor correlated with tinnitus. Abnormal microcirculation, for example, contributes to a sustained reduction in ear blood flow, potentially leading to cochlear damage and increasing tinnitus risk ¹⁸.

Our combined analysis revealed no correlation between vegetable consumption and tinnitus. Identifying the source of heterogeneity was difficult because of the limited number of articles. Nevertheless, sensitivity analyses reaffirmed the strength of our conclusions. Vegetables and fruits,

which are rich in diverse vitamins and minerals crucial for maintaining health, have been shown to improve ear microcirculation, alleviate tinnitus, and offer additional benefits ^{17 32}. Future studies are expected to provide clearer results.

The body has three main sources of energy: carbohydrates (sugars), fats and proteins. Our findings indicate that protein do not increase the occurrence of tinnitus (OR = 1.002, [95% CI 1.001-1.004], p = 0.009). Protein is a crucial nutrient that requires daily consumption and plays a vital role in supporting neuronal activity and neural development³⁷ 38. Inadequate protein intake can lead to ototoxic side effects and impair the neural function of the auditory system³⁹. Dawes et al. demonstrated that a higher intake of dietary pattern factor 3 (high protein) was linked to a reduced likelihood of tinnitus¹⁶. Although low-protein diets may affect auditory vestibular function, no studies have specified the necessary amount of protein in the diet. Our analysis revealed links between protein intake and tinnitus risk. Moreover, high-protein diets have been shown to induce oxidative stress in the cerebral cortex and hypothalamus of rats⁴⁰. Hence, further research on the relationship between protein dosage and tinnitus is warranted in the future. Sugar is an essential daily component, in line with our analysis, no

significant effect of sugar intake on tinnitus incidence was observed (OR

= 0.997 [95% CI 0.967, 1.027]). High sugar consumption is typically

 associated with an unhealthy lifestyle. Proinflammatory foods, including sugary items, are often associated with increased systemic inflammation and microvascular damage, particularly microischemic events⁴¹. Elevated blood glucose levels can harm small blood vessels and nerves in the inner ear, leading to pathological alterations in outer hair cells and spiral ganglion cells. This can result in nerve tissue ischemia and hypoxia, leading to nerve damage³⁹. Conversely, Spankovich et al. demonstrated that high carbohydrate intake can prevent hearing loss in older adults⁴². Tang et al. reported a 45% decrease in tinnitus risk for participants in the fourth quartile compared with the first quartile of carbohydrate intake ¹⁸. Both excessive and insufficient dietary intake may have adverse effects on tinnitus, underscoring the need for a dose-response analysis of diet, which would provide valuable insights for preventing dietary tinnitus. Several studies have suggested that increasing the score of healthy foods, such as fruits, vegetables, legumes, nuts, fish, and dairy products, may lower the risk of cardiovascular disease and mortality⁴³⁻⁴⁵. Each one-fifth increase in the healthy diet score was associated with a corresponding decrease in overall mortality rate (HR = 0.92; 0.90–0.93), severe cardiovascular disease (HR = 0.94; 95% CI: 0.93-0.95), myocardial infarction (HR = 0.94; 0.92-0.96), stroke (HR = 0.94; 0.89-0.99), and death or cardiovascular disease (HR = 0.93; $0.92-0.94^{46}$).

The outcomes of our analysis did not support a notable connection between

 fat intake and tinnitus risk, although there was a discernible upward trend. Moreover, high-fat diets contribute to obesity and can lead to insulin resistance⁴⁷. Conversely, adopting a low-fat/low-cholesterol diet might aid in reducing blood cholesterol and triglyceride levels, potentially alleviating tinnitus symptoms⁴⁸. Future studies are needed to verify the relationship between fat and tinnitus. A recent study revealed that increased levels of dietary variety, including quantity, evenness, and quality, were inversely linked to the risk of depressive symptoms, especially among women and older adults⁴⁹. This could offer relief for tinnitus patients. Moreover, dietary variety is believed to be correlated with insulin resistance⁵⁰. Given the protective effects of various diets on human health, further exploration of dietary variety is necessary to validate significant associations. Our pooled analysis indicated that a varied in diet was not significantly linked to a reduced tinnitus incidence (OR = 0.653 [95% CI 0.410, 1.038]) based on the currently available evidence. We found only one study that investigated the impact of chocolate and flavonoids on the onset of tinnitus 23, but it did not provide sufficient data for a meta-analysis. Flavonoids, which are abundant in fruits and vegetables, offer antioxidant, anti-inflammatory, and vascular health benefits, which align with the pathophysiology of age-related hearing loss and tinnitus⁵¹. Additionally, flavonoids interact with signaling cascades

 involving protein and lipid kinases, inhibiting neuronal death induced by neurotoxicants such as oxygen radicals and promoting neuronal survival and synaptic plasticity⁵². Despite the hypothesis that dietary flavonoids might protect against tinnitus development over a 10-year period. Tang et al. 51. did not support this idea. However, it is important to note that this study has limitations, such as insufficient data collection. Chocolate is a globally consumed product renowned for its high phenolic compound content (flavonoids are a subclass of polyphenols) 53. A study by Lee et al. indicated that chocolate consumption is not linked to tinnitus or tinnitus-related issues²³. An animal study demonstrated that polyphenols alleviate oxidative stress in the cochlea by suppressing apoptotic signaling pathways⁵⁴. Nonetheless, excessive chocolate consumption can have adverse effects on brain hyperexcitability⁵⁵. Future investigations into the association between chocolate consumption and tinnitus should consider the intake dosage. This systematic review and meta-analysis represents the first attempt to

This systematic review and meta-analysis represents the first attempt to explore the epidemiological link between diet and tinnitus. While we examined the relationships between fruit, dietary fiber, and caffeine intake and a reduced incidence of tinnitus, it remains inconclusive whether a causal relationship exists.

Conclusion

Diet-based strategies for tinnitus prevention are anticipated to play a significant role in chronic tinnitus management. Existing evidence suggests that consuming fruit, dietary fiber, caffeine, and dairy may be associated with a reduced incidence of tinnitus. The primary underlying mechanisms may involve the protective effects of these diets on blood vessels and nerves, as well as their anti-inflammatory and antioxidant properties. However, it is crucial to interpret our findings cautiously because of the overall low quality of the evidence available. In the future, further well-designed, large-scale, cross-population cohort studies are warranted to complement and verify the relationship between dietary intake and tinnitus. Additionally, focusing on the dosage and categorization of each dietary intake would provide valuable insights.

Author Contribution

All authors contributed to the study's conception and design. SZ, MZ, XW,
YJ conducted data collection and analysis. SZ, QZ designed the test plan.
QF as the paper guide, control the quality of the paper, XH, XL, XW, HW
drew the chart. XC, LW, LF completed the writing of the test plan. XL and
QZ revised the manuscript. QZ is responsible for the overall content as the
guarantor.

Author Declaration

 The author has no direct conflict of interest.

Ethical Approval

- The article belongs to the review category and does not require the
- approval of the ethics committee.

Funding

- This work was supported by the National Natural Science Foundation of
- China (No. 81774131, 82174198), 'Xinglin Scholars Scientific Research
- Promotion Plan of Chengdu University of Traditional Chinese Medicine
- 436 Innovation team of traditional Chinese medicine otorhinolaryngology
- discipline, natural science (No. XKTD2021003), the Sichuan Natural
- 438 Science Foundation (No. 2023NSFSC0668).

Data availability statement

- The data used to support the findings of this study are available from the
- corresponding author upon request.

Reference

- 1. Mazurek B, Hesse G, Sattel H, et al. S3 Guideline: Chronic Tinnitus : German Society for
- Otorhinolaryngology, Head and Neck Surgery e. V. (DGHNO-KHC). *Hno* 2022;70(11):795-827.
- 447 doi: 10.1007/s00106-022-01207-4 [published Online First: 2022/10/14]

- 448 2. McCormack A, Edmondson-Jones M, Mellor D, et al. Association of dietary factors with
- 449 presence and severity of tinnitus in a middle-aged UK population. PLoS One
- 450 2014;9(12):e114711. doi: 10.1371/journal.pone.0114711 [published Online First: 2014/12/17]
- 3. MacDonald C, Caimino C, Burns-O'Connell G, et al. Tinnitus, Suicide, and Suicidal Ideation:
- 452 A Scoping Review of Primary Research. *Brain Sci* 2023;13(10) doi: 10.3390/brainsci13101496
- 453 [published Online First: 2023/10/28]

- 454 4. Jarach CM, Lugo A, Scala M, et al. Global Prevalence and Incidence of Tinnitus: A
- 455 Systematic Review and Meta-analysis. JAMA Neurol 2022;79(9):888-900. doi
- 456 10.1001/jamaneurol.2022.2189 [published Online First: 2022/08/09]
- 5. Zhou F, Zhang T, Jin Y, et al. Worldwide Tinnitus Research: A Bibliometric Analysis of the
- 458 Published Literature Between 2001 and 2020. Front Neurol 2022;13:828299. doi:
- 459 10.3389/fneur.2022.828299 [published Online First: 2022/02/18]
- 460 6. Langguth B, Kreuzer PM, Kleinjung T, et al. Tinnitus: causes and clinical management.
- 461 Lancet Neurol 2013;12(9):920-30. doi: 10.1016/s1474-4422(13)70160-1 [published Online
- 462 First: 2013/08/21]
- 463 7. Kleinjung T, Peter N, Schecklmann M, et al. The Current State of Tinnitus Diagnosis and
- Treatment: a Multidisciplinary Expert Perspective. *J Assoc Res Otolaryngol* 2024;25(5):413-25.
- 465 doi: 10.1007/s10162-024-00960-3 [published Online First: 2024/08/14]
- 466 8. Park KW, Kullar P, Malhotra C, et al. Current and Emerging Therapies for Chronic Subjective
- 467 Tinnitus. J Clin Med 2023;12(20) doi: 10.3390/jcm12206555 [published Online First:
- 468 2023/10/28]
- 469 9. Sereda M, Xia J, El Refaie A, et al. Sound therapy (using amplification devices and/or sound

- 470 generators) for tinnitus. Cochrane Database Syst Rev 2018;12(12):Cd013094. doi:
- 471 10.1002/14651858.CD013094.pub2 [published Online First: 2018/12/28]
- 472 10. Lewis S, Chowdhury E, Stockdale D, et al. Assessment and management of tinnitus:
- 473 summary of NICE guidance. Bmj 2020;368:m976. doi: 10.1136/bmj.m976 [published Online
- 474 First: 2020/04/03]
- 475 11. Marcrum SC, Engelke M, Goedhart H, et al. The Influence of Diet on Tinnitus Severity:
- 476 Results of a Large-Scale, Online Survey. *Nutrients* 2022;14(24) doi: 10.3390/nu14245356
- 477 [published Online First: 2022/12/24]
- 478 12. Narayanan SS, Murali M, Lucas JC, et al. Micronutrients in tinnitus: A National Health and
- 479 Nutrition Examination Survey analysis. *Am J Otolaryngol* 2022;43(3):103460. doi:
- 480 10.1016/j.amjoto.2022.103460 [published Online First: 2022/04/17]
- 481 13. Aliyeva A, Han JS, Kim Y, et al. Vitamin D Deficiency as a Risk Factor of Tinnitus: An
- 482 Epidemiological Study. Ann Otol Rhinol Laryngol 2024;133(7):647-53. doi
- 483 10.1177/00034894241242330 [published Online First: 2024/03/28]
- 14. Knäpper J, Girauta MV, Coromina J. Effectiveness of Tinnitan Duo® in Subjective Tinnitus
- with Emotional Affectation: A Prospective, Interventional Study. *J Diet Suppl* 2023;20(1):1-14.
- 486 doi: 10.1080/19390211.2021.1944947 [published Online First: 2021/07/06]
- 487 15. Dadgarnia M, Mandegari M, Zand V, et al. The effect of vitamin B12 on idiopathic tinnitus.
- 488 Am J Otolaryngol 2024;45(1):104028. doi: 10.1016/j.amjoto.2023.104028 [published Online
- 489 First: 2023/08/31]
- 490 16. Dawes P, Cruickshanks KJ, Marsden A, et al. Relationship Between Diet, Tinnitus, and
- 491 Hearing Difficulties. Ear Hear 2020;41(2):289-99. doi: 10.1097/aud.000000000000765

- 492 [published Online First: 2019/07/30]
- 493 17. Lee DY, Kim YH. Relationship Between Diet and Tinnitus: Korea National Health and
- 494 Nutrition Examination Survey. Clin Exp Otorhinolaryngol 2018;11(3):158-65. doi:
- 495 10.21053/ceo.2017.01221 [published Online First: 2018/02/13]
- 496 18. Tang D, Tran Y, Shekhawat GS, et al. Dietary Fibre Intake and the 10-Year Incidence of
- Tinnitus in Older Adults. Nutrients 2021;13(11) doi: 10.3390/nu13114126 [published Online
- 498 First: 2021/11/28]

- 19. Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated
- guideline for reporting systematic reviews. *Bmj* 2021;372:n71. doi: 10.1136/bmj.n71 [published
- 501 Online First: 2021/03/31]
- 502 20. Stroup DF, Berlin JA, Morton SC, et al. Meta-analysis of observational studies in
- 503 epidemiology: a proposal for reporting. Meta-analysis Of Observational Studies in
- 504 Epidemiology (MOOSE) group. *Jama* 2000;283(15):2008-12. doi: 10.1001/jama.283.15.2008
- 505 [published Online First: 2000/05/02]
- 506 21. Jarach CM, Lugo A, Garavello W, et al. The Role of Diet in Tinnitus Onset: A Hospital-
- 507 Based Case-Control Study from Italy. Nutrients 2023;15(3) doi: 10.3390/nu15030621
- 508 [published Online First: 2023/02/12]
- 509 22. Tang D, Tran Y, Lewis JR, et al. Associations between intake of dietary flavonoids and the
- 510 10-year incidence of tinnitus in older adults. Eur J Nutr 2022;61(4):1957-64. doi:
- 511 10.1007/s00394-021-02784-w [published Online First: 2022/01/25]
- 512 23. Lee SY, Jung G, Jang MJ, et al. Association of Chocolate Consumption with Hearing Loss
- 513 and Tinnitus in Middle-Aged People Based on the Korean National Health and Nutrition

514	Examination Survey 2012 ⁻ 2013. <i>Nutrients</i> 2019;11(4) doi: 10.3390/nu11040746 [published
515	Online First: 2019/04/03]
516	24. Lee SY, Jung G, Jang MJ, et al. Association of Coffee Consumption with Hearing and
517	Tinnitus Based on a National Population-Based Survey. <i>Nutrients</i> 2018;10(10) doi:
518	10.3390/nu10101429 [published Online First: 2018/10/06]
519	25. Spankovich C, Bishop C, Johnson MF, et al. Relationship between dietary quality, tinnitus
520	and hearing level: data from the national health and nutrition examination survey, 1999-2002.
521	Int J Audiol 2017;56(10):716-22. doi: 10.1080/14992027.2017.1331049 [published Online First:
522	2017/05/30]
523	26. Glicksman JT, Curhan SG, Curhan GC. A prospective study of caffeine intake and risk of
524	incident tinnitus. <i>Am J Med</i> 2014;127(8):739-43. doi: 10.1016/j.amjmed.2014.02.033 [published
525	Online First: 2014/03/13]
526	27. Castro A, Gili M, Visser M, et al. Soft Drinks and Symptoms of Depression and Anxiety in
527	Overweight Subjects: A Longitudinal Analysis of an European Cohort. <i>Nutrients</i> 2023;15(18)
528	doi: 10.3390/nu15183865 [published Online First: 2023/09/28]
529	28. Makki NM, Alharbi ST, Alharbi AM, et al. Caffeine Consumption and Depression, Anxiety,
530	and Stress Levels Among University Students in Medina: A Cross-Sectional Study. Cureus
531	2023;15(10):e48018. doi: 10.7759/cureus.48018 [published Online First: 2023/11/02]
532	29. Min J, Cao Z, Cui L, et al. The association between coffee consumption and risk of incident
533	depression and anxiety: Exploring the benefits of moderate intake. Psychiatry Res
534	2023;326:115307. doi: 10.1016/j.psychres.2023.115307 [published Online First: 2023/06/23]
535	30. Imam-Fulani A, Owoyele BV. Effect Of Caffeine and Adrenaline on Memory and Anxiety in

536	Male Wistar Rats. Niger J Physiol Sci 2022;37(1):69-76. doi: 10.54548/njps.v37i1.9 [published
537	Online First: 2022/08/11]
538	31. Cresswell M, Casanova F, Beaumont RN, et al. Understanding Factors That Cause Tinnitus:
539	A Mendelian Randomization Study in the UK Biobank. Ear Hear 2022;43(1):70-80. doi:
540	10.1097/aud.00000000001074 [published Online First: 2021/06/11]
541	32. Tomanic M, Belojevic G, Jovanovic A, et al. Dietary Factors and Tinnitus among
542	Adolescents. <i>Nutrients</i> 2020;12(11) doi: 10.3390/nu12113291 [published Online First:
543	2020/10/31]
544	33. Barber TM, Kabisch S, Pfeiffer AFH, et al. The Health Benefits of Dietary Fibre. <i>Nutrients</i>
545	2020;12(10) doi: 10.3390/nu12103209 [published Online First: 2020/10/25]
546	34. Mangabeira Albernaz PL, Fukuda Y. Glucose, insulin and inner ear pathology. Acta
547	Otolaryngol 1984;97(5-6):496-501. doi: 10.3109/00016488409132927 [published Online First:
548	1984/05/01]
549	35. Borghi C, Cosentino ER, Rinaldi ER, et al. Tinnitus in elderly patients and prognosis of mild-
550	to-moderate congestive heart failure: a cross-sectional study with a long-term extension of the
551	clinical follow-up. <i>BMC Med</i> 2011;9:80. doi: 10.1186/1741-7015-9-80 [published Online First:
552	2011/06/30]
553	36. Jeong Y, Lee KW, Kim H, et al. Association of milk and dairy product consumption with the
554	incidence of cardio-cerebrovascular disease incidence in middle-aged and older Korean adults:
555	a 16-year follow-up of the Korean Genome and Epidemiology Study. Nutr Res Pract
556	2023;17(6):1225-37. doi: 10.4162/nrp.2023.17.6.1225 [published Online First: 2023/12/06]
557	37. Cui F, Li H, Cao Y, et al. The Association between Dietary Protein Intake and Sources and

- 558 the Rate of Longitudinal Changes in Brain Structure. *Nutrients* 2024;16(9) doi:
- 559 10.3390/nu16091284 [published Online First: 2024/05/11]
- 38. Abey NO, Ebuehi OAT, Imaga NOA. Neurodevelopment and Cognitive Impairment in
- 561 Parents and Progeny of Perinatal Dietary Protein Deficiency Models. Front Neurosci
- 562 2019;13:826. doi: 10.3389/fnins.2019.00826 [published Online First: 2019/09/26]
- 39. Chen HL, Tan CT, Wu CC, et al. Effects of Diet and Lifestyle on Audio-Vestibular
- 564 Dysfunction in the Elderly: A Literature Review. *Nutrients* 2022;14(22) doi:
- 565 10.3390/nu14224720 [published Online First: 2022/11/27]
- 566 40. Żebrowska E, Maciejczyk M, Żendzian-Piotrowska M, et al. High Protein Diet Induces
- Oxidative Stress in Rat Cerebral Cortex and Hypothalamus. *Int J Mol Sci* 2019;20(7) doi:
- 568 10.3390/ijms20071547 [published Online First: 2019/03/31]
- 41. Sardone R, Lampignano L, Guerra V, et al. Relationship between Inflammatory Food
- 570 Consumption and Age-Related Hearing Loss in a Prospective Observational Cohort: Results
- from the Salus in Apulia Study. *Nutrients* 2020;12(2) doi: 10.3390/nu12020426 [published
- 572 Online First: 2020/02/13]
- 573 42. Spankovich C, Hood LJ, Silver HJ, et al. Associations between diet and both high and low
- pure tone averages and transient evoked otoacoustic emissions in an older adult population-
- 575 based study. *J Am Acad Audiol* 2011;22(1):49-58. doi: 10.3766/jaaa.22.1.6 [published Online
- 576 First: 2011/03/23]
- 577 43. Ocagli H, Berti G, Rango D, et al. Association of Vegetarian and Vegan Diets with
- 578 Cardiovascular Health: An Umbrella Review of Meta-Analysis of Observational Studies and
- 579 Randomized Trials. Nutrients 2023;15(19) doi: 10.3390/nu15194103 [published Online First:

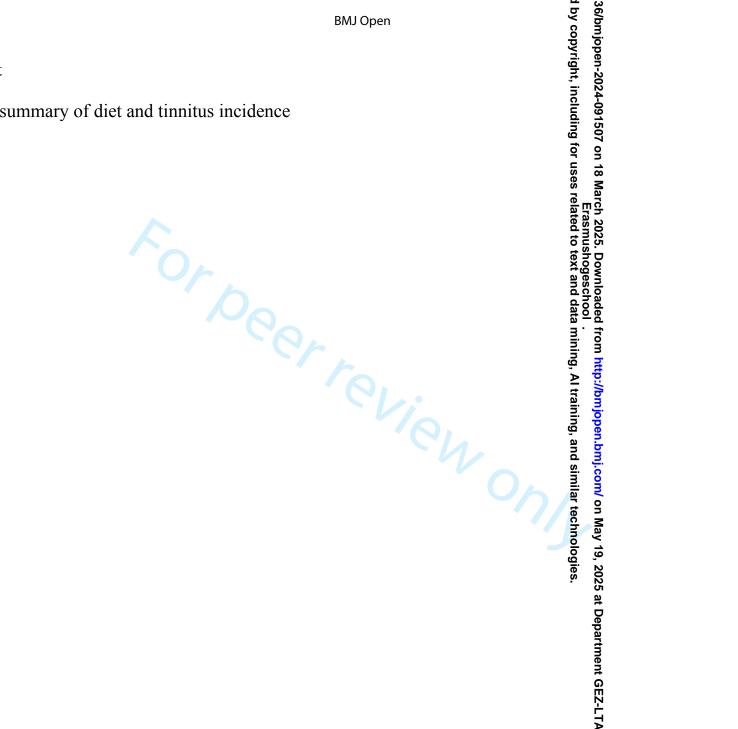
580 2023/10/14]

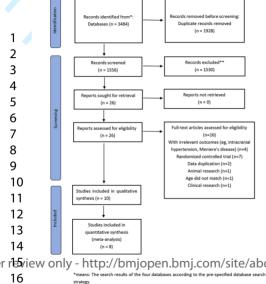
- 581 44. Tan L, Stagg L, Hanlon E, et al. Associations between Vegetable Nitrate Intake and
- 582 Cardiovascular Disease Risk and Mortality: A Systematic Review. *Nutrients* 2024;16(10) doi:
- 583 10.3390/nu16101511 [published Online First: 2024/05/25]
- 45. Doundoulakis I, Farmakis IT, Theodoridis X, et al. Effects of dietary interventions on
- 585 cardiovascular outcomes: a network meta-analysis. *Nutr Rev* 2024;82(6):715-25. doi:
- 586 10.1093/nutrit/nuad080 [published Online First: 2023/07/11]
- 46. Mente A, Dehghan M, Rangarajan S, et al. Diet, cardiovascular disease, and mortality in
- 588 80 countries. *Eur Heart J* 2023;44(28):2560-79. doi: 10.1093/eurheartj/ehad269 [published
- 589 Online First: 2023/07/07]
- 590 47. Tsai SF, Wu HT, Chen PC, et al. High-fat diet suppresses the astrocytic process
- arborization and downregulates the glial glutamate transporters in the hippocampus of mice.
- 592 Brain Res 2018;1700:66-77. doi: 10.1016/j.brainres.2018.07.017 [published Online First:
- 593 2018/07/17]
- 48. Musleh A, Alshehri S, Qobty A. Hyperlipidemia and its relation with tinnitus: Cross-sectional
- 595 approach. Niger J Clin Pract 2022;25(7):1046-49. doi: 10.4103/njcp.njcp_1465_21 [published
- 596 Online First: 2022/07/22]
- 597 49. Li Z, Li PW, Zhang D. Association between all aspects of dietary diversity and risk of
- 598 depressive symptoms in US adults. Food Funct 2023;14(20):9204-11. doi:
- 599 10.1039/d3fo00642e [published Online First: 2023/10/04]
- 50. Mozaffari H, Hosseini Z, Lafrenière J, et al. The role of dietary diversity in preventing
- 601 metabolic-related outcomes: Findings from a systematic review. *Obes Rev* 2021;22(6):e13174.

602	doi: 10.1111/obr.13174 [published Online First: 2021/02/23]
603	51. Tang D, Tran Y, Shekhawat GS, et al. Dietary Flavonoid Intake and Chronic Sensory
604	Conditions: A Scoping Review. Antioxidants (Basel) 2022;11(7) doi: 10.3390/antiox11071214
605	[published Online First: 2022/07/28]
606	52. Nehlig A. The neuroprotective effects of cocoa flavanol and its influence on cognitive
607	performance. Br J Clin Pharmacol 2013;75(3):716-27. doi: 10.1111/j.1365-2125.2012.04378.x
608	[published Online First: 2012/07/11]
609	53. da Silva Medeiros N, Koslowsky Marder R, Farias Wohlenberg M, et al. Total Phenolic
610	Content and Antioxidant Activity of Different Types of Chocolate, Milk, Semisweet, Dark, and
611	Soy, in Cerebral Cortex, Hippocampus, and Cerebellum of Wistar Rats. Biochem Res Int
612	2015;2015:294659. doi: 10.1155/2015/294659 [published Online First: 2015/12/10]
613	54. Sánchez-Rodríguez C, Cuadrado E, Riestra-Ayora J, et al. Polyphenols protect against
614	age-associated apoptosis in female rat cochleae. Biogerontology 2018;19(2):159-69. doi:
615	10.1007/s10522-018-9747-7 [published Online First: 2018/01/25]
616	55. Cicvaric A, Bulat T, Bormann D, et al. Sustained consumption of cocoa-based dark
617	chocolate enhances seizure-like events in the mouse hippocampus. Food Funct
618	2018;9(3):1532-44. doi: 10.1039/c7fo01668a [published Online First: 2018/02/13]
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Figure 1: Flow chart

Figure 2: Risk ratio summary of diet and tinnitus incidence





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^{**}means: The process of selecting articles for title and abstract based on inclusion exclusion criteria.

1 2 3 4 5 6 7 8 9 10 11 12 13 14							BMJ Open: first published as 10.1136/b Protected by		
15_	Type of diet	Study, n	I^2	OR	LOR	UOR		Grade	Evidence class
16_							¥		
17 18	Carbohydrate	2	33.0%	1.001	1.000	1.002	en-2024-091507 on right, including for	Low	NS
19	Caffeine	3	23.0%	0.898	0.862	0.935		Low	Class II
	Varied diet	2	50.0%	0.653	0.410	1.038	nc!	Very low	NS
20	Egg	2	55.0%	1.010	0.880	1.160	udi	Very low	NS
21	Fruit	3	0.0%	0.649	0.532	0.793	ing 507	Moderate	Class II
22	Fiber	3	63.0%	0.918	0.851 0.973	0.990	for on	Low	Class II
23	Fat	3	73.0%	1.072		1.181		Very low	NS
24	Margarine Meat	2	0.0% 0.0%	1.208 1.099	0.900 0.783	1.622 1.542		Low	NS NS
25	Protein	2 2	0.0%	1.099	1.001	1.004	8 March 2025. Downl Erasmushoges ses related to text an	Low Low	Class III
26 27	Sugar	3	0.0%	0.997	0.967	1.004	Era at	Low	NS
28	Fish	3	72.0%	0.937	0.907	1.056		Very low	NS
29	Vegetable	4	0.0%	1.101	0.907	1.337	to 25.	Very low	NS
30	Water	3	0.0%	1.003	0.992	1.014	i Do	Low	NS
31	Dairy	2	0.0%	0.827	0.766	0.892	wnic t and	Low	Class II
32 33_	2 411.)		0.070	0.02	0.700	0.052	0.000 0.200 0.400 0.600 0.800 1.000 1.200 1.400 at 50	25	
			·	·	·		<u> </u>	·	

34The blue or red dots represent OR values, and the black linesrepresent confidence intervals
35
36p<0.05 indicates statistical difference.
37The evidence classification criteria: Class I (convincing evidence), Class II (highly suggestive evidence), Class III (suggestive evidence), Class IV

³⁸(weak evidence), and NS (non-significant). training, and similar technologies.

³⁹₄₀GRADE:Grade of Recommendations Assessment, Development, and Evaluation.

41 Moderate: The results of current efficacy evaluation are likely to be close to the true value;

42Low: The reliability of the current efficacy evaluation results is uncertain;

⁴³Very low: The reliability of the current efficacy evaluation results is very uncertain;

BMJ Open Catalogue Search Strategy Stata analysis Stata analysis BMJ Open Catalogue Description Catalogue Description Catalogue Description Catalogue Description Catalogue Analysis Analysis Analysis Analysis Analysis Analysis Analysis Analysis software _______3 eFigure 3: Forest Plot Showing the Association Between diversity and tinnitus. eFigure 4: Forest Plot Showing the Association Between egg and tinnitus. eFigure 5: Forest Plot Showing the Association Between fruit and tinnitus. 5 eFigure 5: Forest Plot Showing the Association Between fruit and tinnitus. 7 7 eFigure 6: Forest Plot Showing the Association Between fiber and tinnitus. eFigure 7: Forest Plot Showing the Association Between fat and tinnitus. eFigure 8: Forest Plot Showing the Association Between margarine and tinnitus. eFigure 9: Forest Plot Showing the Association Between meat and tinnitus. eFigure 10: Forest Plot Showing the Association Between sugar and tinnitus. eFigure 11: Forest Plot Showing the Association Between protein and tinnitus. eFigure 12: Forest Plot Showing the Association Between fish and tinnitus. eFigure 13: Forest Plot Showing the Association Between vegetable and tinnitus. eFigure 14: Forest Plot Showing the Association Between water and tinnitus. eFigure 15: Forest Plot Showing the Association Between dairy and tinnitus. eFigure 16: Sensitivity analysis between caffeine and tinnitus. eFigure 17:Sensitivity analysis between fruit and tinnitus. eFigure 18:Sensitivity analysis between fiber and tinnitus. eFigure 19:Sensitivity analysis between vegetable and tinnitus. eFigure 20:Sensitivity analysis between sugar and tinnitus. eFigure 21:Publication bias and Egger test on caffeine

eFigure 23: Publication bias and Egger test on fiber.

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eFigure 25:Publication bias and Egger test on sugar.	,	<u></u> 3:
eFigure 26:Publication bias and Egger test on fat.	Cl	3:
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We used mixed-effects models to pool maximally covariate-adjusted odds ratios (ORs) from each study. Due to the low incidence of events and short follow-up events, OR, RR, and inter-study heterogeneity to be significant. For observational studies, we maximally support covariate-adjusted estimates. If a tues uses an analytical method that is incompatible with synthesis for most other studies, we convert the effect estimate to the appropriate combined ratio or exclude the study from the recta-analysis.

Stata analysis

Publication bias

If the article heterogeneity is large in the analysis with statistical differences, we will use meta regression to investigate the source of the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with visual and Egger's bias, and estimated the possible missing studies with eMethods if publication bias is suspected by the funnel plot with the funne

Analysis software	e						nd dat	าloaded school	
We conducted all analy significant.	rses using stata (v	ersion 16) a	and Revie	w Manager (vers	ion 5.3).	Unless otherwise spec	ified, we commi	de red a two-sided	P value of <0.05 as statisti
eFigure 1: Forest							, Al training,	http://bm jopen yelght apportioned	to studies in the meta- analy
Carbohydrate: OR=1.00	, [95%CI 1.00,1.0	0], I ² =33%, ₁	p=0.05.				dsim	nj. cor	
				Odds Ratio		Odds Ratio	iii ar	ال (
Study or Subgroup	log[Odds Ratio]	SE	Weight	IV, Fixed, 95% CI		IV, Fixed, 95%		<u> </u>	
Diana Tang 2021a	-0.3011051	0.2326598	0.0%	0.74 [0.47, 1.17]			앍	May	
Diana Tang 2021b	-0.3024573	0.2282614	0.0%	0.74 [0.47, 1.16]	•				
Diana Tang 2021c	-0.597837	0.2483288	0.0%	0.55 [0.34, 0.89]	•	- 8	logie	9,	
Doh Young Lee 2018	0.0009995	0.0005102	100.0%	1.00 [1.00, 1.00]			es	2025	
Piers Dawes 2020a	0.0295588	0.0492101	0.0%	1.03 [0.94, 1.13]		35 3	75		
Piers Dawes 2020b	-0.0202027	0.059233	0.0%	0.98 [0.87, 1.10]	88	65 - 23		at [
Piers Dawes 2020c	-0.0100503	0.0719008	0.0%	0.99 [0.86, 1.14]	- 33	9359		Эер	
Piers Dawes 2020d	-0.0725707	0.0876968	0.0%	0.93 [0.78, 1.10]	•	3		Department	
Total (95% CI)			100.0%	1.00 [1.00, 1.00]				nent	
Heterogeneity: Chi2 = 1	0.46, $df = 7$ ($P = 0.1$	6); I ² = 33%			0.05	0.9	11	- 유 -	
Test for overall effect: Z		373 3			0.85 Favo	urs [experimental] Favo	urs [control]	GEZ-LTA	

Study	ES	[95% Conf. I	nterval]	% Weight
Diana Tang 2021a	0.740	0.469	1.168	0.00
Diana Tang 2021b	0.739	0.472	1.156	0.00
Diana Tang 2021c	0.550	0.338	0.895	0.00
Doh Young Lee 2018	1.001	1.000	1.002	99.97
Piers Dawes 2020a	1.030	0.935	1.134	0.01
Piers Dawes 2020b	0.980	0.873	1.101	0.01
Piers Dawes 2020c	0.990	0.860	1.140	0.01
Piers Dawes 2020d	0.930	0.783	1.104	0.00
T-V pooled FS	1.001	1.000	1.002	100.00

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Micaela Jarach 2023a	Carlotta Micaela Jarach 2023a
Micaela Jarach 2023b	Carlotta Micaela Jarach 2023b
Micaela Jarach 2023b -0.3710637	Carlotta Micaela Jarach 2023b
Glicksman 2014b -0.0943106 0.0393242 28.0% 0.91 [0.84, 0.98]	Jordan T Glicksman 2014b
Glicksman 2014b -0.0943106 0.0393242 28.0% 0.91 [0.84, 0.98]	Jordan T Glicksman 2014b
Glicksman 2014c -0.1625189 0.0569244 13.4% 0.85 [0.76, 0.95]	Jordan T Glicksman 2014c -0.1625189 0.0569244 13.4% 0.85 [0.76, 0.95]
Telicksman 2014d -0.2357223 0.0743244 7.8% 0.79 [0.68, 0.91] و الله الله الله الله الله الله الله ال	Sang-Youp Lee 2018c -0.0512933 0.1386774 2.3% 0.95 [0.72, 1.25]
up Lee 2018 -0.2231435 0.1178662 3.1% 0.80 [0.63, 1.01]	Sang-Youp Lee 2018c -0.0512933 0.1386774 2.3% 0.95 [0.72, 1.25]
up Lee 2018b -0.1053605 0.1045972 4.0% 0.90 [0.73, 1.10]	Sang-Youp Lee 2018c -0.0512933 0.1386774 2.3% 0.95 [0.72, 1.25]
up Lee 2018c -0.0512933 0.1386774 2.3% 0.95 [0.72, 1.25] · · · · · · · · · · · · · · · · · · ·	
99 99 99	Total (05% CI)
% CI)	100.0% 0.30 [0.00, 0.34]
ANT CHANGE OF CASE OF	Heterogeneity: Chi² = 10.43, df = 8 (P = 0.24); l² = 23% 0.7
	00.0% 0.90 [0.80, 0.94]

Study	ES	[95% Conf.	Interval]	% Weight
 Carlotta Micaela Jar	0.490	0.241	0.995	0.33
Carlotta Micaela Jar	0.690	0.336	1.415	0.32
Jordan T 2014a	0.940	0.882	1.002	40.76
Jordan T 2014b	0.910	0.842	0.983	28.03
Jordan T 2014c	0.850	0.760	0.950	13.38
Jordan T 2014d	0.790	0.683	0.914	7.85
Sang-Youp Lee 2018	0.800	0.635	1.008	3.12
Sang-Youp Lee 2018	0.900	0.733	1.105	3.96
Sang-Youp Lee 2018	0.950	0.724	1.247	2.25
I-V pooled ES	0.898	0.862	0.935	100.00

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Study	ES	[95% Conf.	. Interval]	% Weight	· • •
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Carlotta Micaela Jar	0.690	0.336	1.415	0.32	
Jordan T 2014a	0.940	0.882	1.002	40.76	
Jordan T 2014b	0.910	0.842	0.983	28.03	use
Jordan T 2014c	0.850	0.760	0.950	13.38	s Mai
Jordan T 2014d	0.790	0.683	0.914	7.85	ea mc
Sang-Youp Lee 2018	0.800	0.635	1.008	3.12	as: ted
Sang-Youp Lee 2018	0.900	0.733	1.105	3.96	
Sang-Youp Lee 2018	0.950	0.724	1.247	2.25	text
I-V pooled ES	0.898	0.862	0.935	100.00	March 2025. Downloaded Erasmushogeschool es related to text and data
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Actually: Caffeine: OR=0.8	98, [95%CI	0.862,0.935]			
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Black diamonds are the esti Diversity: OR=0.65, [95%C Study or Subgroup Carlotta Micaela Jarach 20 Carlotta Micaela Jarach 20 Christopher Spankovich 20 Total (95% CI) Heterogeneity: Tau ² = 0.09	mated poole CI 0.41,1.04 log[0 23a 23b 017	ed odd ratio (Ol], I ² =50% p=0.0 Odds Ratio] -0.6348783 0.1 -0.7550226 0.1 -0.0444 , df= 2 (P = 0.14	R) for each ra 08. SE We 3247361 29 3371826 28 0.2295 41	Odds Ratio ight IV, Random, 95 0.7% 0.47 [0.24, 0.48] 0.96 [0.61, 1	nalysis; Red box sizes reflect the relative weight apportioned to studies in the meta- and odds Ratio odds Rat

Study	ES	[95% Conf.	Interval]	% Weight
+ Carlotta Micaela Jar	0.530	0.280	1.002	29.86
Carlotta Micaela Jar	0.470	0.243	0.910	28.60
Christopher Spankovi	0.950	0.606	1.490	41.54
D+L pooled ES	0.653	0.410	1.038	100.00

				ВМЈ О	pen	Page Page Page Page Page Page Page Page
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Study	ES	[95% Co	onf.	Interval]	% Weight)24-091507
Carlotta Micaela Ja	r 0.530	0.28	80	1.002	29.86	for on
Carlotta Micaela Ja	r 0.470	0.24	13	0.910	28.60	u 18
Christopher Spankov	i 0.950	0.60	96	1.490	41.54	Marc Feb
D+L pooled ES	0.653	0.41	10	1.038	100.00	18 March 2025. Downloaded Erasmushogeschool uses related to text and data
Actually: diversity: OR=0.653,	[95%CI 0.410, 1.03	8].				. Dow
5						and
6						hade da
⁷ eFigure 4: Forest Plot	Showing the	Association	n Ret	ween eoo and t	innitus	ta · · · · · · · · · · · · · · · · · · ·
8	Showing the 1	1550014110	пъсс	ween egg and t	iiiiitus.	ni n
9 Rlack diamonds are the estimate	ed pooled odd ratio	(OR) for each	randon	n-effects meta-analys	sis: Red boy size	s reflect the relative weight apportioned to studies in the meta-analysis
Black diamonds are the estimate Egg: OR=1.02, [95%CI 0.91,1.			ranuon	ii-criccis ilicia-aliarys	sis, Red box size:	
22	- J ,			Odds Ratio		Odds Ratio train p IV, Random, 95% 51 9
Study or Subgroup	log[Odds Ratio]	SE I	Weight	IV, Random, 95% CI		Odds Ratio (1) 10 10 10 10 10 10 10 10 10 10 10 10 10
4 Abby McCormack 2014a	0.0304592		43.4%	1.03 [0.98, 1.09]		
5 Abby McCormack 2014b			32.9%			and bm
6 Abby McCormack 2014c			17.3%	0.90 [0.72, 1.13]		j.com/ c
7 Carlotta Micaela Jarach 2023a		0.338181	3.0%	0.99 [0.51, 1.92]		ii ž
8 Carlotta Micaela Jarach 2023b	-0.6161861	0.3157843	3.4%	0.54 [0.29, 1.00]		
9 O Total (95% CI)		9	100.0%	1.02 [0.91, 1.15]		on May- techno
Heterogeneity: Tau ^z = 0.01; Ch	i²= 8 83 df= 4 (P=)			1.02 [0.5 1, 1.15]	F +	
riciciogeneity, rau = 0.01, Ci	10 - 0.03, $ui - 4 (i - 1)$	3.07), 1 - 33 %			0.01 0.1	1 ©
Test for overall effect: $7 = 0.32$	(P = 0.75)					
	(P = 0.75)				Favours [exp	
	(P = 0.75)				Favours [exp	perimental] Favour (can captrol)
} }	(P = 0.75)				Favours [exp	perimental] Favour (can captrol)
} 	(P = 0.75)				Favours [exp	perimental] Favour (can captrol)
3 1 5	(P = 0.75)				Favours [exp	perimental] Favour (can captrol)
Test for overall effect: Z = 0.32 Test for overall effect: Z = 0.32 Test for overall effect: Z = 0.32	(P = 0.75)				Favours [exp	perimental] Favour (can captrol)
	(P = 0.75)				Favours [exp	perimental] Favour (can captrol)
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	(P = 0.75)				Favours [exp	

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. metan logrr selogrr,	label(na	mevar=author)	random efo	rm			
Study	ES	[95% Conf.	Interval]	% Weight		-2024-091507 ht, including	
Abby McCormack 2014	1.031	0.926	1.148	36.13		507 on	
Abby McCormack 2014a	1.149	1.024	1.290	35.00			
Abby McCormack 2014b	0.901	0.717	1.133	20.41		18 March Er. uses relat	
Carlotta Micaela Jar	0.990	0.510	1.921	3.97		rch Era	
Carlotta Micaela Jar	0.540	0.291	1.003	4.50		arch 2025. Erasmus	
D+L pooled ES	1.010	0.880	1.160	100.00		Downlo: shogesch	
Actually: diversity: OR=1.010, [95	%CI 0.880, 1.1	60].	60,			Downloaded from hogeschool .	
eFigure 5: Forest Plot Sh	owing the	Association Be	tween fruit a	nd tinnitus.	ę	ո http://br	
Black diamonds are the estimated pruit: OR=0.65, [95%CI 0.53,0.79]	oooled odd ration, I ² =0% p<0.00	o (OR) for each rando	om-effects meta-ar	alysis; Red box sizes	•	<u> </u>	es in the meta-a
			Odds Ratio		Odds Ratio	in br	

Study or Subgroup	log[Odds Ratio]	SE	Weight	Odds Ratio IV, Fixed, 95% CI	Odds Ratio and billion of the state of the s
Carlotta Micaela Jarach 2023a	-0.040822	0.3655756	7.7%	0.96 [0.47, 1.97]	nila vij
Carlotta Micaela Jarach 2023b	-0.2484614	0.3083197	10.9%	0.78 [0.43, 1.43]	ar e
Christopher Spankovich 2017	-0.4942963	0.2033897	25.0%	0.61 [0.41, 0.91]	n Ma
Diana Tang 2021a	-0.7550226	0.2457749	17.1%	0.47 [0.29, 0.76]	ay nnc
Diana Tang 2021b	-0.3856625	0.230163	19.5%	0.68 [0.43, 1.07]	
Diana Tang 2021c	-0.3710637	0.2290667	19.7%	0.69 [0.44, 1.08]	
Total (95% CI)			100.0%	0.65 [0.53, 0.79]	
Heterogeneity: Chi² = 3.43, df = 5	$5 (P = 0.63); I^2 = 0\%$				100 100
Test for overall effect: $Z = 4.24$ (F					0.01 0.1 1 100 100 100 100 Favours [experimental] Favours [control]
					EZ-LTA

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. metan logrr selogrr,	label(na	mevar=author)) fixed efor	m	6/bmjopen-2024-091507 on 18 March 2025 Erasmu by copyright, including for uses related to	
Study	ES	[95% Conf.	Interval]	% Weight	124-091 includi	
Carlotta Micaela Jar	0.960	0.469	1.965	7.74	507 o	
Carlotta Micaela Jar	0.780	0.426	1.427	10.88	r n 1	
Christopher Spankovi	0.610	0.409	0.909	25.01	ses Ma	
Diana Tang 2021a	0.470	0.290	0.761	17.13	arch Er	
Diana Tang 2021b	0.680	0.433	1.068	19.53	20: as n ted	
Diana Tang 2021d	0.690	0.440	1.081	19.72	25. Do nusho to te)	
I-V pooled ES	0.649	0.532	0.793	100.00	ownload gescho ct and da	
Actually: fruit: OR=0.649, [95%C	I 0.532, 0.793]				ded from htt lool . data mining,	
eFigure 6: Forest Plot Sl	nowing the	Association B	Setween fiber	and tinnitus.	http://b	
Black diamonds are the estimated priber: OR=0.92, [95%CI 0.85,0.99]			dom-effects meta-	analysis; Red box sizes	s reflect the relative with the apportioned	d to studies in the meta- analys
_		0	dds Ratio	Odd	Is Ratio	

				Odds Ratio		Odds	Ratio	nd
Study or Subgroup	log[Odds Ratio]	SE	Weight	IV, Random, 95% CI	IV, Random, 95% CI			<u>s</u>
Diana Tang 2021a	-0.5108256	0.243222	2.3%	0.60 [0.37, 0.97]	8	-		<u>⊒</u> .
Diana Tang 2021b	-0.1392621	0.2282217	2.6%	0.87 [0.56, 1.36]	(a)	50-0	-	ilar t
Diana Tang 2021c	-0.2613648	0.2306047	2.5%	0.77 [0.49, 1.21]	69		- 80	tech
Doh Young Lee 2018	0.003992	0.0022879	27.8%	1.00 [1.00, 1.01]			•	Ę
Piers Dawes 2020a	-0.0304592	0.0527859	18.3%	0.97 [0.87, 1.08]		-	539	nologies
Piers Dawes 2020b	-0.0943106	0.0588071	16.9%	0.91 [0.81, 1.02]		-	t	gie
Piers Dawes 2020c	-0.1508229	0.0622392	16.1%	0.86 [0.76, 0.97]		=		Ñ
Piers Dawes 2020d	-0.1392621	0.0759266	13.4%	0.87 [0.75, 1.01]			1	
Total (95% CI)			100.0%	0.92 [0.85, 0.99]		•		
Heterogeneity: Tau² = (0.01; Chi² = 19.09, d	df = 7 (P = 0.0)	$(08); I^2 = 0$	63%	0.5	0.7	1 1.5	-
Test for overall effect: 2	Z = 2.21 (P = 0.03)				A000 00 TOX	100 March 100	Favours [co	ontroll
					i avodia (ex	penmental	i avodis įco	ALL OIL

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1	. metan logrr selogrr	, label(na	mevar=author) random efo	rm	<u>©</u> 7
2	Study	ES	[95% Conf.	Interval]	% Weight	1t, including
4 5	Diana Tang 2021a	0.600	0.372	0.966	2.31	9150
5	Diana Tang 2021b	0.870	0.556	1.361	2.59	——————————————————————————————————————
7	Diana Tang 2021d	0.770	0.490	1.210	2.54	
8	Doh Young Lee 2018	1.004	1.000	1.009	27.81	us es M
9	Piers Dawes 2020a	0.970	0.875	1.076	18.30	
10	Piers Dawes 2020b	0.910	0.811	1.021	16.90	arch 20 Erass
11	Piers Dawes 2020c	0.860	0.761	0.972	16.14	h 202 ated t
12 13	Piers Dawes 2020d	0.870	0.750	1.010	13.40	o te
14 15	D+L pooled ES	0.918	0.851	0.990	100.00	Downloaded odd and data
16 17	Actually: fruit: OR=0.918, [9	+ 05%CI	 <mark>0 9901</mark>	,~N) _	data
18	rectually. Hult. OK 0.910, [5	737001 0.031,	<u>0.770</u>].			m. fro
19						
20	E'	. (1)	43 A •	. D.		d, tt
21	eFigure 7: Forest Plo	ot Showing	g the Associ	ation Betwe	en tat and tinnit	18.
22						ain <u>ä</u> i
23	Black diamonds are the estin	nated pooled o	dd ratio (OR) for	r each random-e	ffects meta-analysis; Re	d box sizes reflect the relative what apportioned to studies in the meta- analysis.
24	Fat: OR=1.07, [95%CI 0.97,					a n. t.
25					Odds Ratio	Odds Ratio 2 3
26	Study or Subgroup	log[Odds	Ratio]	SE Weight IV,	Random, 95% CI	IV, Random, 95% 🖨 🙎

-0.3710637	0.170/122		IV, Random, 95% CI	IV, Random, 95% 🖨 🙎
	0.1734132	5.9%	0.69 [0.49, 0.98]	nila
0.0029955	0.0010173	27.8%	1.00 [1.00, 1.01]	† r
0.0582689	0.0574609	20.2%	1.06 [0.95, 1.19]	n May
0.0861777	0.0700094	17.8%	1.09 [0.95, 1.25]	hno
0.1739534	0.0832964	15.5%	1.19 [1.01, 1.40]	log 19,
0.285179	0.1010838	12.8%	1.33 [1.09, 1.62]	2025
		100.0%	1.07 [0.97, 1.18]	5 at
= 18.68, df = 5 (P =	= 0.002); I ² =	73%	70 NO.	
= 0.16)				0.5 0.7 1 1.5 ਨੂੰ2 Favours [experimental] Favours [comਫ਼ਾol]
				nen
				t GE
	0.0861777 0.1739534 0.285179 : 18.68, df= 5 (P=		0.0861777 0.0700094 17.8% 0.1739534 0.0832964 15.5% 0.285179 0.1010838 12.8% 100.0% 18.68, df = 5 (P = 0.002); l² = 73%	0.0861777 0.0700094 17.8% 1.09 [0.95, 1.25] 0.1739534 0.0832964 15.5% 1.19 [1.01, 1.40] 0.285179 0.1010838 12.8% 1.33 [1.09, 1.62] 100.0% 1.07 [0.97, 1.18] 18.68, df = 5 (P = 0.002); = 73%

Study	ES	[95% Conf.	Interval]	% Weight	
Christopher Spankovi	0.690	0.485	0.981	5.95	
Doh Young Lee 2018	1.003	1.001	1.005	27.75	
Piers Dawes 2020a	1.060	0.947	1.186	20.17	
Piers Dawes 2020b	1.090	0.950	1.250	17.81	
Piers Dawes 2020c	1.190	1.011	1.401	15.50	
Piers Dawes 2020d	1.330	1.091	1.621	12.82	
D+L pooled ES	1.072	0.973	1.181	100.00	

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Study	ES	[95% Conf.	Interval]] % Weight	t							
Christopher Spankovi	0.690	0.485	0.981	5.95)1507				
Doh Young Lee 2018	1.003	1.001	1.005	27.75			3	î on				
Piers Dawes 2020a	1.060	0.947	1.186	20.17			2					
Piers Dawes 2020b	1.090	0.950	1.250	17.81			ğ					
Piers Dawes 2020c	1.190	1.011	1.401	15.50			9	arc				
Piers Dawes 2020d	1.330	1.091	1.621	12.82			מופת	8 March 2025. Erasmus				
D+L pooled ES	1.072	0.973	1.181	100.00				25. Downloaded nushogeschool				
			ation Dat	10/h		: 4	ā E	d from htt				
Actually: fat: OR=1.072, [95% eFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI	t Showing	g the Associ dd ratio (OR) for 2=0% p=0.20.	each randon	. (alysis; Red box		ي Ratio	from http://bm.bht webpen.bmj	apportio	ned to st	tudies in	the meta- a
eFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI	t Showing ated pooled o 0.90,1.63], I	g the Associ dd ratio (OR) for 2=0% p=0.20.	seach randon SE Weight 302 3.0%	n-effects meta-ana Odds Ratio IV, Fixed, 95% CI 1.35 [0.25, 7.36]	alysis; Red box	sizes reflect t	ي Ratio	from http://bm.bht webpen.bmj	apportio	ned to st	tudies in	the meta- a
eFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Carlotta Micaela Jarach 2023	t Showing ated pooled o 0.90,1.63], I log[Odd: a 0.3 b 0.3	g the Associ dd ratio (OR) for the form of the period of	se Weight 502 3.0% 543 2.3%	Odds Ratio N, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89]	alysis; Red box	sizes reflect t	Ratio 9 , 95% CI 0	from http://bm.ppen.bmj.com/ o	apportio	ned to st	tudies in	the meta- a
EFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Milena Tomanic 2020	t Showing ated pooled o 0.90,1.63], I log[Odd: a 0.3 b 0.3	g the Associ dd ratio (OR) fo. 2=0% p=0.20. s Ratiol 001046 0.8652	se Weight 602 3.0% 543 2.3% 309 94.7%	n-effects meta-ana Odds Ratio IV, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89] 1.20 [0.89, 1.63]	alysis; Red box	sizes reflect t	Ratio 9 , 95% CI 0	from http://bm.ppen.bmj.com/ o	apportion	ned to st	tudies in	the meta- a
EFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Milena Tomanic 2020 Total (95% CI)	t Showing ated pooled o 0.90,1.63], I log[Odd: a	dd ratio (OR) for 2=0% p=0.20. SRatio 001046 0.8652 364722 0.9974 856494 0.154	se Weight 602 3.0% 543 2.3% 309 94.7%	Odds Ratio N, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89]	alysis; Red box	sizes reflect t	ي Ratio	from http://bm/bpen.bmj.com/ on May	apportion	ned to st	tudies in	the meta- a
EFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Carlotta Micaela Jarach 2023 Milena Tomanic 2020 Total (95% CI) Heterogeneity: Chi² = 0.04, df	t Showing ated pooled o 0.90,1.63], I log[Odd: a	dd ratio (OR) for 2=0% p=0.20. SRatio 001046 0.8652 364722 0.9974 856494 0.154	se Weight 602 3.0% 543 2.3% 309 94.7%	n-effects meta-ana Odds Ratio IV, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89] 1.20 [0.89, 1.63]	alysis; Red box	Odds IV, Fixed,	Ratio 9	from http://bm.ppen.bmj.com/ on May 19	apportion	ned to st	tudies in	the meta- a
EFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Milena Tomanic 2020 Total (95% CI)	t Showing ated pooled o 0.90,1.63], I log[Odd: a	dd ratio (OR) for 2=0% p=0.20. SRatio 001046 0.8652 364722 0.9974 856494 0.154	se Weight 602 3.0% 543 2.3% 309 94.7%	n-effects meta-ana Odds Ratio IV, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89] 1.20 [0.89, 1.63]	alysis; Red box	Odds IV, Fixed,	Ratio 95% CI 95% CI	from http://bm.bpen.bmj.com/ on May 19, 20		ned to st	tudies in	the meta- a
eFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Carlotta Micaela Jarach 2023 Milena Tomanic 2020 Total (95% CI) Heterogeneity: Chi² = 0.04, df	t Showing ated pooled o 0.90,1.63], I log[Odd: a	dd ratio (OR) for 2=0% p=0.20. SRatio 001046 0.8652 364722 0.9974 856494 0.154	se Weight 602 3.0% 543 2.3% 309 94.7%	n-effects meta-ana Odds Ratio IV, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89] 1.20 [0.89, 1.63]	alysis; Red box	Odds IV, Fixed	Ratio 95% CI 95% CI	from http://bm.pepen.bmj.com/ on May 19, 2025		ned to st	tudies in	the meta- a
Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Carlotta Micaela Jarach 2023 Milena Tomanic 2020 Total (95% CI) Heterogeneity: Chi² = 0.04, df	t Showing ated pooled o 0.90,1.63], I log[Odd: a	dd ratio (OR) for 2=0% p=0.20. SRatio 001046 0.8652 364722 0.9974 856494 0.154	se Weight 602 3.0% 543 2.3% 309 94.7%	n-effects meta-ana Odds Ratio IV, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89] 1.20 [0.89, 1.63]	alysis; Red box	Odds IV, Fixed	Ratio 95% CI 95% CI	from http://bm.pepen.bmj.com/ on May 19, 2025		ned to st	tudies in	the meta- a
eFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Carlotta Micaela Jarach 2023 Milena Tomanic 2020 Total (95% CI) Heterogeneity: Chi² = 0.04, df	t Showing ated pooled o 0.90,1.63], I log[Odd: a	dd ratio (OR) for 2=0% p=0.20. SRatio 001046 0.8652 364722 0.9974 856494 0.154	se Weight 602 3.0% 543 2.3% 309 94.7%	n-effects meta-ana Odds Ratio IV, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89] 1.20 [0.89, 1.63]	alysis; Red box	Odds IV, Fixed	Ratio 95% CI 95% CI	from http://bm.pepen.bmj.com/ on May 19, 2025		ned to st	tudies in	the meta- a
eFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Carlotta Micaela Jarach 2023 Milena Tomanic 2020 Total (95% CI) Heterogeneity: Chi² = 0.04, df	t Showing ated pooled o 0.90,1.63], I log[Odd: a	dd ratio (OR) for 2=0% p=0.20. SRatio 001046 0.8652 364722 0.9974 856494 0.154	se Weight 602 3.0% 543 2.3% 309 94.7%	n-effects meta-ana Odds Ratio IV, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89] 1.20 [0.89, 1.63]	alysis; Red box	Odds IV, Fixed	Ratio 95% CI 95% CI	from http://bm.pepen.bmj.com/ on May 19, 2025		ned to st	tudies in	the meta- a
eFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Carlotta Micaela Jarach 2023 Milena Tomanic 2020 Total (95% CI) Heterogeneity: Chi² = 0.04, df	t Showing ated pooled o 0.90,1.63], I log[Odd: a	dd ratio (OR) for 2=0% p=0.20. SRatio 001046 0.8652 364722 0.9974 856494 0.154	se Weight 602 3.0% 543 2.3% 309 94.7%	n-effects meta-ana Odds Ratio IV, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89] 1.20 [0.89, 1.63]	alysis; Red box	Odds IV, Fixed	Ratio 95% CI 95% CI	from http://bm.pepen.bmj.com/ on May 19, 2025		ned to st	tudies in	the meta- a
eFigure 8: Forest Plo Black diamonds are the estima Margarine: OR=1.21, [95%CI Study or Subgroup Carlotta Micaela Jarach 2023 Carlotta Micaela Jarach 2023 Milena Tomanic 2020 Total (95% CI) Heterogeneity: Chi² = 0.04, df	t Showing ated pooled o 0.90,1.63], I log[Odd: a	dd ratio (OR) for 2=0% p=0.20. SRatio 001046 0.8652 364722 0.9974 856494 0.154	se Weight 602 3.0% 543 2.3% 309 94.7%	n-effects meta-ana Odds Ratio IV, Fixed, 95% CI 1.35 [0.25, 7.36] 1.40 [0.20, 9.89] 1.20 [0.89, 1.63]	alysis; Red box	Odds IV, Fixed	Ratio 95% CI 95% CI	from http://bm.bpen.bmj.com/ on May 19, 20		ned to st	tudies in	the meta- a

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Study	ES	[9!	5% Conf.	Interval]	% Weight	-09150 cluding	
Carlotta Micaela Ja	ar 1.35 0)	0.248	7.359	3.01	7 on 7	
Carlotta Micaela Ja	ar 1.400)	0.198	9.889	2.27	18 N	
			0.887	1.624	94.72	larch 20 Eras	
I-V pooled ES	1.208	3	0.900	1.622	100.00)25. Do	
	+					wnlo ges ano	
Actually: margarine: OR=1 208 [95%CL0 900_1 6	221				oade choc	
rictainy. margarine. Or 1.200,	2570010.500, 1.02	-2].				ed f	
						ni. rom	
eFigure 9: Forest Plot S	howing the A	ssociatio	n Between	n meat and tinn	itus.	ո http://	
Black diamonds are the estimated	pooled odd ratio (OR) for each	n random-effe	cts meta-analysis; Red	box sizes reflect the relative	weight apportioned to studies	in the meta- analysis.
		,				ing	•
			Ode	ds Ratio	Odds Ratio	, an.b	
Study or Subgroup	log[Odds Ratio]	SE	Weight IV, Fi	xed, 95% CI	IV, Fixed, 95% CI	<u>d</u> <u>3</u>	
Carlotta Micaela Jarach 2023a						in C	
Carlotta Micaela Jarach 2023b						n/ c	
	Carlotta Micaela Ja Carlotta Micaela Ja Milena Tomanic 2020 I-V pooled ES Actually: margarine: OR=1.208, Ja Black diamonds are the estimated Meat: OR=1.10, [95%CI 0.78,1.5] Study or Subgroup Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b	Carlotta Micaela Jar 1.356 Carlotta Micaela Jar 1.406 Milena Tomanic 2020 1.206 I-V pooled ES 1.208 Actually: margarine: OR=1.208, [95%CI 0.900, 1.62 eFigure 9: Forest Plot Showing the A Black diamonds are the estimated pooled odd ratio (Meat: OR=1.10, [95%CI 0.78,1.54], I²=0% p=0.59. Study or Subgroup log[Odds Ratio] Carlotta Micaela Jarach 2023a 0.3987761 -0.0304592	Carlotta Micaela Jar 1.350 Carlotta Micaela Jar 1.400 Milena Tomanic 2020 1.200 I-V pooled ES 1.208 Actually: margarine: OR=1.208, [95%CI 0.900, 1.622]. eFigure 9: Forest Plot Showing the Associatio Black diamonds are the estimated pooled odd ratio (OR) for each Meat: OR=1.10, [95%CI 0.78,1.54], I²=0% p=0.59. Study or Subgroup log[Odds Ratio] SE Carlotta Micaela Jarach 2023a 0.3987761 0.3484928 Carlotta Micaela Jarach 2023b -0.0304592 0.3287067	Carlotta Micaela Jar 1.350	Carlotta Micaela Jar 1.350 0.248 7.359 Carlotta Micaela Jar 1.400 0.198 9.889 Milena Tomanic 2020 1.200 0.887 1.624 I-V pooled ES 1.208 0.900 1.622 Actually: margarine: OR=1.208, [95%CI 0.900, 1.622]. PeFigure 9: Forest Plot Showing the Association Between meat and tinning Black diamonds are the estimated pooled odd ratio (OR) for each random-effects meta-analysis; Red Meat: OR=1.10, [95%CI 0.78,1.54], I²=0% p=0.59. Odds Ratio Study or Subgroup log[Odds Ratio] SE Weight IV, Fixed, 95% CI Carlotta Micaela Jarach 2023a 0.3987761 0.3484928 24.6% 1.49 [0.75, 2.95] Carlotta Micaela Jarach 2023b -0.0304592 0.3287067 27.6% 0.97 [0.51, 1.85]	Carlotta Micaela Jar 1.350 0.248 7.359 3.01 Carlotta Micaela Jar 1.400 0.198 9.889 2.27 Milena Tomanic 2020 1.200 0.887 1.624 94.72 I-V pooled ES 1.208 0.900 1.622 100.00 Actually: margarine: OR=1.208, [95%CI 0.900, 1.622]. eFigure 9: Forest Plot Showing the Association Between meat and tinnitus. Black diamonds are the estimated pooled odd ratio (OR) for each random-effects meta-analysis; Red box sizes reflect the relative Meat: OR=1.10, [95%CI 0.78,1.54], I²=0% p=0.59. Odds Ratio Study or Subgroup log Odds Ratio SE Weight V. Fixed, 95% CI V. Fixed, 95% CI Carlotta Micaela Jarach 2023a 0.3987761 0.3484928 24.6% 1.49 [0.75, 2.95] Carlotta Micaela Jarach 2023b -0.0304592 0.3287067 27.6% 0.97 [0.51, 1.85]	Carlotta Micaela Jar 1.350 0.248 7.359 3.01 0.248 7.359 3.01 0.248 7.359 3.01 0.248 7.359 3.01 0.248 7.359 3.01 0.248 7.359 3.01 0.248 7.359 3.01 0.248 0.248 7.359 3.01 0.248

Study or Subgroup	log[Odds Ratio]	SE	Weight	Odds Ratio IV, Fixed, 95% CI	Odds Ratio IV, Fixed, 95% CI	n.bm J, and	
Carlotta Micaela Jarach 2023a	0.3987761	0.3484928	24.6%	1.49 [0.75, 2.95]	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	sim :	
Carlotta Micaela Jarach 2023b	-0.0304592	0.3287067	27.6%	0.97 [0.51, 1.85]	-	ıila	
Christopher Spankovich 2017	0.0099503	0.2496967	47.8%	1.01 [0.62, 1.65]	3 - -	on I	
Total (95% CI)			100.0%	1.10 [0.78, 1.54]	•	May chno	
Heterogeneity: Chiz = 1.02, df = 1	$2 (P = 0.60); I^2 = 0\%$	i			0.01	<u>0</u> 1 0	400
Test for overall effect: Z = 0.55 (F	P = 0.59)				0.01 0.1 1 Favours [experimental] Favours	2025 at [@ntr5 at	100

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Study	ES	[95% Conf.	Interval]	% Weight	4-09150 acludin
Carlotta Micaela Jar Carlotta Micaela Jar Christopher Spankovi	1.490 0.970 1.010	0.753 0.509 0.619	2.950 1.847 1.648	24.56 27.60 47.84	7 on 18 March 20 Erasi g for uses related
I-V pooled ES	1.099	0.783	1.542	100.00	25. Dow nushoge to text a
Actually: meat: OR=1.099, [95%CI 0.783	3, 1.542].	MA		·	hloaded i school .

eFigure 10: Forest Plot Showing the Association Between sugar and tinnitus.

Black diamonds are the estimated pooled odd ratio (OR) for each random-effects meta-analysis; Red box sizes reflect the relative weight apportioned to studies in the meta-analysis. Sugar: OR=1.00, [95%CI 0.97,1.03], I²=0% p=0.84.

Study or Subgroup	log[Odds Ratio]	SE	Weight	Odds Ratio IV, Fixed, 95% CI	Odds Ratio a 5 IV, Fixed, 95% CI 3.
Abby McCormack 2014a	0	0.0230439	44.3%	1.00 [0.96, 1.05]	win is
Abby McCormack 2014b	0.0099503	0.0233327	43.2%	1.01 [0.96, 1.06]	ii Z
Abby McCormack 2014c	-0.0294288	0.0469906	10.7%	0.97 [0.89, 1.06]	r te on
Carlotta Micaela Jarach 2023a	-0.0725707	0.3247361	0.2%	0.93 [0.49, 1.76]	The Management of the Manageme
Carlotta Micaela Jarach 2023b	-0.210721	0.3237852	0.2%	0.81 [0.43, 1.53]	+ <u>5 3</u>
Diana Tang 2021a	-0.4462871	0.236286	0.4%	0.64 [0.40, 1.02]	• • • • • • • • • • • • • • • • • • •
Diana Tang 2021b	-0.0618754	0.2243772	0.5%	0.94 [0.61, 1.46]	- ii 20:
Diana Tang 2021c	-0.356675	0.2383442	0.4%	0.70 [0.44, 1.12]	9s.
Fotal (95% CI)			100.0%	1.00 [0.97, 1.03]	D _{ep}
Heterogeneity: Chi² = 6.89, df = 3	$7 (P = 0.44); I^2 = 0\%$,			
Test for overall effect: Z = 0.20 (F	9 = 0.84				0.7 0.85 1 1.2 물5 Favours [experimental] Favours [contr e l]
					avours [experimental]
					G E
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Study	ES	[95% Conf.	Interval]	% Weight	
Abby McCormack 2014	1.000	0.956	1.046	44.34	
Abby McCormack 2014a	1.010	0.965	1.057	43.25	
Abby McCormack 2014b	0.971	0.886	1.065	10.66	
Carlotta Micaela Jar	0.930	0.492	1.758	0.22	
Carlotta Micaela Jar	0.810	0.429	1.528	0.22	
Diana Tang 2021a	0.640	0.403	1.017	0.42	
Diana Tang 2021b	0.940	0.606	1.459	0.47	
Diana Tang 2021c	0.700	0.439	1.117	0.41	
I-V pooled ES	0.997	0.967	1.027	100.00	

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2	Study	E	S [95%	Conf.	Interval]	% Weight				
4 5	Abby McCormack 2014	1 1.00	ø e	956	1.046	44.34	1000)24-091507 on including for		
6	Abby McCormack 2014	la 1.01	9 6	.965	1.057	43.25		7 on		
7	Abby McCormack 2014	16 0.97	1 6	.886	1.065	10.66		n 18		
8	Carlotta Micaela Ja	er 0.93	9 8	.492	1.758	0.22		18 Ma		
9	Carlotta Micaela Ja	ar 0.81	0 0	.429	1.528	0.22		arci Feli		
10	Diana Tang 2021a	0.64	9 6	.403	1.017	0.42		h 20 ras		
11 12	Diana Tang 2021b	0.94		.606	1.459	0.47		D25 mu to		
13	Diana Tang 2021c	0.70		.439	1.117	0.41		. Dow shog text		
14 15 16	I-V pooled ES	0.99	7 6	967	1.027	100.00		March 2025. Downloaded from http://bmjop Erasmushogeschool es related to text and data mining, Al trainin		
22 23 24 25 26	eFigure 11: Forest I Black diamonds are the esti Fish: OR=1.00, [95%CI 1.0	mated pooled	odd ratio (OI		ch random-effects		pox sizes reflect the relative	ဖြင့် v မွှောwe မျှောht apporti	ioned to studies in the meta-analy	sis.
27	Cturbs or Cuberous Io	alOddo Datiol	er.	Majabi	Odds Ratio	1	Odds Ratio	j.com/ simila		
28	Study or Subgroup lo Doh Young Lee 2018	g[Odds Ratio]			IV, Fixed, 95% CI	(a)	V, Fixed, 95% CI			
29	Piers Dawes 2020a		0.0007634 0.0546964		1.00 [1.00, 1.00] 1.02 [0.92, 1.14]		—	ech		
30	Piers Dawes 2020b	0.0190020	0.060906		1.01 [0.90, 1.14]			May 19, chnolog		
31 32	Piers Dawes 2020c	-0.0304592			0.97 [0.85, 1.11]		4	ın May 19, 202 technologies.		
33	Piers Dawes 2020d		0.0858348		1.06 [0.90, 1.25]			2025 jies.		
34										
35	Total (95% CI)			100.0%	1.00 [1.00, 1.00]			Ď		
36	Heterogeneity: Chi ² = 0.78,		5.00			0.01 0.1	1 10	a 00		
37	Test for overall effect: $Z = 2$.62 (P = 0.009)					nental] Favours [control]	T T		
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Study	ES .	[95% Conf. Interval]	% Weight
Doh Young Lee 2018	1.002	1.001 1.004	99.94
Piers Dawes 2020a	1.020	0.91 6 1.135	0.02
Piers Dawes 2020b	1.010	0.896 1.138	0.02
Piers Dawes 2020c	0.970	0.849 1.108	0.01
Piers Dawes 2020d	1.060	0.896 1.254	0.01
I-V pooled ES	1.002	1.001 1.004	100.00

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Study	ES [95% Conf.	. Interva	al] % Wei	ght		by copyright, including for				
Doh Young Lee 2018	1.002	1.001	1.004	4 99.	94		ing fo	507 D			
Piers Dawes 2020a	1.020	0.916	1.13	5 0.	02		for use	<u> </u>			
Piers Dawes 2020b	1.010	0.896	1.138	8 0.	02		uses	6 S			
Piers Dawes 2020c	0.970	0.849	1.10	8 0.	01		E III	3			
Piers Dawes 2020d	1.060	0.896	1.25				rasm ated t	ร ว			
I-V pooled ES	1.002	1.001	1.004	4 100.	00		usho to text	Э			
eFigure 12: Forest Plot	Showing the	Associat	ion Rotu	veen fish and	tinnitus		ining,	3			
eFigure 12: Forest Plot Black diamonds are the estimate Fish: OR=0.98 [95%CL0.91.1.0	d pooled odd ratio	(OR) for eac				lect the relat	₹ .	ght appor	tioned to	studies in	the meta-ana
Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0	d pooled odd ratio 5], I ² =72% p=0.57	(OR) for eac	ch random-e	ffects meta-analysi	s; Red box sizes ref	Odds Ratio	traging, a	ght appor	tioned to	studies in	the meta-ana
Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0	d pooled odd ratio 5], I ² =72% p=0.57 log[Odds Ratio]	(OR) for eac	ch random-e Weight IV	ffects meta-analysi Odds Ratio , Random, 95% Cl	s; Red box sizes ref		trawing, and	ght appor	tioned to	studies in	the meta-ana
Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0 Study or Subgroup Abby McCormack 2014a	d pooled odd ratio 5], I ² =72% p=0.57 log[Odds Ratio] -0.0202027	(OR) for each	weight W	ffects meta-analysi Odds Ratio , Random, 95% CI 0.98 [0.95, 1.02]	s; Red box sizes ref	Odds Ratio	trawing, and	ght appor	tioned to	studies in	the meta-ana
Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0	d pooled odd ratio 5], I ² =72% p=0.57 log[Odds Ratio]	(OR) for eac SE 0.0181367 0.0197415	ch random-e Weight IV	ffects meta-analysi Odds Ratio , Random, 95% CI 0.98 [0.95, 1.02] 0.91 [0.88, 0.95]	s; Red box sizes ref	Odds Ratio	traway iving, and simila	ght appor	tioned to	studies in	the meta-ana
Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0 Study or Subgroup Abby McCormack 2014a Abby McCormack 2014b	d pooled odd ratio S], I ² =72% p=0.57 log[Odds Ratio]	(OR) for eac SE 0.0181367 0.0197415	Weight IV 34.4% 33.9%	ffects meta-analysi Odds Ratio , Random, 95% CI 0.98 [0.95, 1.02]	s; Red box sizes ref	Odds Ratio	trawing, and similar te	ght appor	tioned to	studies in	the meta-ana
Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0 Study or Subgroup Abby McCormack 2014a Abby McCormack 2014b Abby McCormack 2014c Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b	d pooled odd ratio [5], I ² =72% p=0.57 log[Odds Ratio] -0.0202027 -0.0943106 0.0769611 0.1739534 -0.2876821	(OR) for each	Weight IV 34.4% 33.9% 25.8% 1.0% 1.3%	ffects meta-analysi Odds Ratio (Random, 95% CI 0.98 [0.95, 1.02] 0.91 [0.88, 0.95] 1.08 [1.00, 1.17] 1.19 [0.59, 2.39] 0.75 [0.41, 1.39]	s; Red box sizes ref	Odds Ratio	trawing, and similar techr	ght appor	tioned to	studies in	the meta-ana
Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0 Study or Subgroup Abby McCormack 2014a Abby McCormack 2014b Abby McCormack 2014c Carlotta Micaela Jarach 2023a	d pooled odd ratio [5], I ² =72% p=0.57 log[Odds Ratio] -0.0202027 -0.0943106 0.0769611 0.1739534 -0.2876821	(OR) for each	Weight IV 34.4% 33.9% 25.8% 1.0%	ffects meta-analysi Odds Ratio Random, 95% Cl 0.98 [0.95, 1.02] 0.91 [0.88, 0.95] 1.08 [1.00, 1.17] 1.19 [0.59, 2.39]	s; Red box sizes ref	Odds Ratio	trawing, and similar technolog	ght appor	tioned to	studies in	the meta-ana
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Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0] Study or Subgroup Abby McCormack 2014a Abby McCormack 2014b Abby McCormack 2014c Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b Milena Tomanic 2020 Total (95% CI)	d pooled odd ratio [5], I ² =72% p=0.57 log[Odds Ratio] -0.0202027 -0.0943106 0.0769611 0.1739534 -0.2876821 0.003992	(OR) for each SE 0.0181367 0.0197415 0.0404261 0.3557993 0.3132832 0.1847285	Weight IV 34.4% 33.9% 25.8% 1.0% 1.3% 3.6%	ffects meta-analysi Odds Ratio (Random, 95% CI 0.98 [0.95, 1.02] 0.91 [0.88, 0.95] 1.08 [1.00, 1.17] 1.19 [0.59, 2.39] 0.75 [0.41, 1.39]	s; Red box sizes ref	Odds Ratio	traibing, and similar technologies.	th appor	— →	studies in	the meta-ana
Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0 Study or Subgroup Abby McCormack 2014a Abby McCormack 2014b Abby McCormack 2014c Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b Milena Tomanic 2020	d pooled odd ratio S], I ² =72% p=0.57 log[Odds Ratio]	(OR) for each SE 0.0181367 0.0197415 0.0404261 0.3557993 0.3132832 0.1847285	Weight IV 34.4% 33.9% 25.8% 1.0% 1.3% 3.6%	ffects meta-analysi Odds Ratio Random, 95% CI 0.98 [0.95, 1.02] 0.91 [0.88, 0.95] 1.08 [1.00, 1.17] 1.19 [0.59, 2.39] 0.75 [0.41, 1.39] 1.00 [0.70, 1.44]	s; Red box sizes ref	Odds Ratio	trawing, and similar technologies.	th appor	tioned to	studies in	the meta-ana
Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0] Study or Subgroup Abby McCormack 2014a Abby McCormack 2014b Abby McCormack 2014c Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b Milena Tomanic 2020 Total (95% CI) Heterogeneity: Tau² = 0.00; Chi²	d pooled odd ratio S], I ² =72% p=0.57 log[Odds Ratio]	(OR) for each SE 0.0181367 0.0197415 0.0404261 0.3557993 0.3132832 0.1847285	Weight IV 34.4% 33.9% 25.8% 1.0% 1.3% 3.6%	ffects meta-analysi Odds Ratio Random, 95% CI 0.98 [0.95, 1.02] 0.91 [0.88, 0.95] 1.08 [1.00, 1.17] 1.19 [0.59, 2.39] 0.75 [0.41, 1.39] 1.00 [0.70, 1.44]	s; Red box sizes ref	Odds Ratio	trawing, and similar technologies.	th appor	- -	studies in	the meta-ana
Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0] Study or Subgroup Abby McCormack 2014a Abby McCormack 2014b Abby McCormack 2014c Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b Milena Tomanic 2020 Total (95% CI) Heterogeneity: Tau² = 0.00; Chi²	d pooled odd ratio S], I ² =72% p=0.57 log[Odds Ratio]	(OR) for each SE 0.0181367 0.0197415 0.0404261 0.3557993 0.3132832 0.1847285	Weight IV 34.4% 33.9% 25.8% 1.0% 1.3% 3.6%	ffects meta-analysi Odds Ratio Random, 95% CI 0.98 [0.95, 1.02] 0.91 [0.88, 0.95] 1.08 [1.00, 1.17] 1.19 [0.59, 2.39] 0.75 [0.41, 1.39] 1.00 [0.70, 1.44]	s; Red box sizes ref	Odds Ratio	trawing, and similar technologies.	th appor	- -	studies in	the meta-ana
Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0] Study or Subgroup Abby McCormack 2014a Abby McCormack 2014b Abby McCormack 2014c Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b Milena Tomanic 2020 Total (95% CI) Heterogeneity: Tau² = 0.00; Chi²	d pooled odd ratio S], I ² =72% p=0.57 log[Odds Ratio]	(OR) for each	Weight IV 34.4% 33.9% 25.8% 1.0% 1.3% 3.6%	ffects meta-analysi Odds Ratio Random, 95% CI 0.98 [0.95, 1.02] 0.91 [0.88, 0.95] 1.08 [1.00, 1.17] 1.19 [0.59, 2.39] 0.75 [0.41, 1.39] 1.00 [0.70, 1.44]	s; Red box sizes ref	Odds Ratio	trawing, and similar technologies.	th appor	- -	studies in	the meta-ana
Black diamonds are the estimate Fish: OR=0.98, [95%CI 0.91,1.0] Study or Subgroup Abby McCormack 2014a Abby McCormack 2014b Abby McCormack 2014c Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b Milena Tomanic 2020 Total (95% CI) Heterogeneity: Tau² = 0.00; Chi²	d pooled odd ratio S], I ² =72% p=0.57 log[Odds Ratio]	(OR) for each	Weight IV 34.4% 33.9% 25.8% 1.0% 1.3% 3.6%	ffects meta-analysi Odds Ratio Random, 95% CI 0.98 [0.95, 1.02] 0.91 [0.88, 0.95] 1.08 [1.00, 1.17] 1.19 [0.59, 2.39] 0.75 [0.41, 1.39] 1.00 [0.70, 1.44]	s; Red box sizes ref	Odds Ratio	trawing, and similar technologies.	th appor	- -	studies in	the meta-ana

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Study	ES	[95% Conf.	Interval]	% Weight	
Abby McCormack 2014 Abby McCormack 2014a	0.980 0.910	0.946 0.875	1.015 0.946	35.43 34.93	
Abby McCormack 2014b	1.080	0.998	1.169	27.04	
Carlotta Micaela Jar Carlotta Micaela Jar	1.190 0.750	0.593 0.406	2.390 1.386	1.14 1.46	
D+L pooled ES	0.979	0.907	1.056	100.00	

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2 3 4	Study	ES	[95% Cor	nf. Ir	nterval]	% Weight	, including for	-2024-091507			
5	Abby McCormack 2014	0.980	0.946	6	1.015	35.43	ling f				
6 7	Abby McCormack 2014a	0.910	0.875	5	0.946	34.93		on `			
8	Abby McCormack 2014b	1.080	0.998	8	1.169	27.04	uses	<u>8</u>			
9	Carlotta Micaela Jar	1.190	0.593	3	2.390	1.14	re	larc E			
10 11	Carlotta Micaela Jar	0.750	0.406	6	1.386	1.46	related	18 March 2025. Erasmu			
12 13	D+L pooled ES	0.979	0.907	 7	1.056	100.00	~				
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15 16	Actually: fish: OR=0.979, [95%C	CI 0.907, 1.056].					da	hoc thoc			
17		,,					ta n	. ₹. . ₹.			
18							<u>a</u> i.	m O			
19 20	eFigure 13: Forest Plot	Showing the	Associati	ion Be	tween vegeta	able and tinnitus.	ng,	htt			
21	8	8					A E	p://l			
22	Black diamonds are the estimated	pooled odd ratio	(OR) for eac	h randon	n-effects meta-ana	alysis; Red box sizes refle	ct the relatives	veitht appo	rtioned to st	udies in the me	eta- analysis.
23	Vegetable: OR=1.10, [95%CI 0.9	1,1.34], I ² =0% p=	=0.33				ing	bpe			•
24 25	1000 St 52500	to recover account	9 80005	\$99000000	Odds Ratio		ds Ratio and ced, 95% CI	n.b			
26	Study or Subgroup	log[Odds Ratio]		- Party (1000) (1000)	IV, Fixed, 95% CI	IV, Fix	ced, 95% Cl o	<u>om</u>			
27	Carlotta Micaela Jarach 2023a Carlotta Micaela Jarach 2023b	-0.2613648 -0.2876821	0.3602729		0.77 [0.38, 1.56] 0.75 [0.40, 1.41]	- 10 <u>- 10 - 10 - 10 - 10 - 10 - 10 - 10</u>	similar	com/			
28	Christopher Spankovich 2017		0.321390		1.25 [0.89, 1.76]		ar t	v on			
29	Diana Tang 2021a		0.2411069		1.32 [0.82, 2.12]	9 0	tec				
30	Diana Tang 2021b	-0.0304592			0.97 [0.60, 1.56]		• no	ay			
31	Diana Tang 2021c		0.2357803		1.19 [0.75, 1.89]	95	¢hnologies	May 19,			
32 33	T. J. 1 (05) (0)			400.0%	4 40 50 04 4 043		ies.	2025			
34	Total (95% CI)	(D 0.53) 13 00(100.0%	1.10 [0.91, 1.34]	i i		Ω Ω	1		
35	Heterogeneity: Chi ² = 3.88, df = 5 Test for overall effect: Z = 0.98 (P		i			0.2 0.5	1 2	Ď	5		
36	Test for overall effect. Z = 0.98 (P	= 0.33)				Favours [experimenta	al] Favours [cor	ntr & l]			
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Study	ES	[95% Conf.	Interval:] % Weight	including	24-091	
Carlotta Micaela Jar	0.770	0.380	1.560	7.56			
Carlotta Micaela Jar	0.750	0.399	1.408	9.50	for u	on	
Christopher Spankovi	1.250	0.886	1.763	31.89	IS es		
Diana Tang 2021a	1.320	0.823	2.117	16.88	8 Te _	<i>l</i> lar	
Diana Tang 2021b	0.970	0.602	1.564	16.52	Era	다. -	
Diana Tang 2021c	1.190	0.750	1.889	17.65	d to	2025.	
I-V pooled ES	1.101	0.907	1.337	100.00	Erasmushogeschool . uses related to text and data mining, Al tra	Down	
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Actually: vegetable: OR=1.101,	[95%CI 0.907	<mark>7, 1.337]</mark> .			ta .	<u>u</u>	
					n i	Ō	
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eFigure 14: Forest Plot	C				= •	<u> </u>	
Black diamonds are the estimate Water: OR=1.00, [95%CI 0.99,1	ed pooled odd	ratio (OR) for eac	h random-effe	ects meta-analysis; Red box sizes re		th apportioned to studies in t	the meta- analysis.
water. OK-1.00, [93/6CI 0.99,1	.01], 120/6		Odds Ratio	Odds Ratio	and	 bn	
Study or Subgroup log	[Odds Ratio]	SE Weight IV		IV, Fixed, 95% CI	<u>s.</u>	⊒ . •	
Carlotta Micaela Jarach 2023a Doh Young Lee 2018 Milena Tomanic 2020	-0.1743534 0.3 0.0029955 0.0 0.1889661 0.3	0055957 99.8% 1	.84 [0.43, 1.65] .00 [0.99, 1.01] .21 [0.95, 1.54]	-	similar te	.bmj.com/ on May	
Total (95% CI)		100.0% 1	00 [0.99, 1.01]		c h	X	
Heterogeneity: Chi ² = 2.50, df = 2 (P =	0.29); F = 20%	100.0%	[0.33, 1.01]	- 4 1 1	technologies.	y 19,	
Test for overall effect: Z = 0.59 (P = 0.5				0.5 0.7 1 1.5 Favours [experimental] Favours [contri	of <u>G</u>	, 2	
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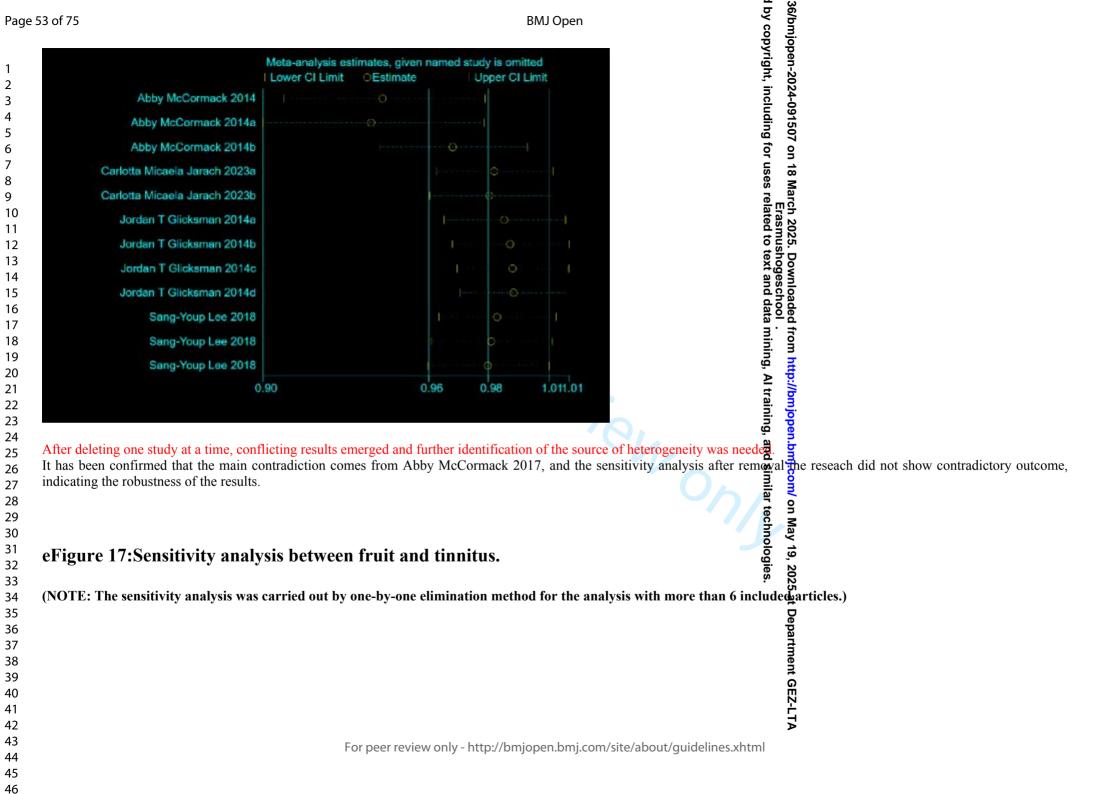
log[Odds Ratio]	SE	Weight	IV, Fixed, 95% CI		s Ratio <u>d,</u> 95% CI
-0.1743534	0.3430473	0.0%	0.84 [0.43, 1.65]	2000	The second secon
0.0029955	0.0055957	99.8%	1.00 [0.99, 1.01]		
0.1889661	0.1243716	0.2%	1.21 [0.95, 1.54]		
		100.0%	1.00 [0.99, 1.01]		•
$(P = 0.29); P = 20^\circ$	X ₀			0.5 0.7	1 15 2
= 0.55)				Favours [experimental]	Favours [control]
	-0.1743534 0.0029955 0.1889661	-0.1743534 0.3430473 0.0029955 0.0055957 0.1889661 0.1243716	-0.1743534 0.3430473 0.0% 0.0029955 0.0055957 99.8% 0.1889661 0.1243716 0.2% (P = 0.29); P = 20%	10g Odds Ratio SE Weight IV, Fixed, 95% Cl -0.1743534 0.3430473 0.0% 0.84 [0.43, 1.65] -0.0029955 0.0055957 99.8% 1.00 [0.99, 1.01] -0.1889661 0.1243716 0.2% 1.21 [0.95, 1.54]	log[Odds Ratio] SE Weight IV, Fixed, 95% Cl IV, Fixed -0.1743534 0.3430473 0.0% 0.84 [0.43, 1.65] 0.0029955 0.0055957 99.8% 1.00 [0.99, 1.01] 0.1889661 0.1243716 0.2% 1.21 [0.95, 1.54] -1.00 [0.99, 1.01] 0.00% 1.00 [0.99, 1.01] 0.5 0.7

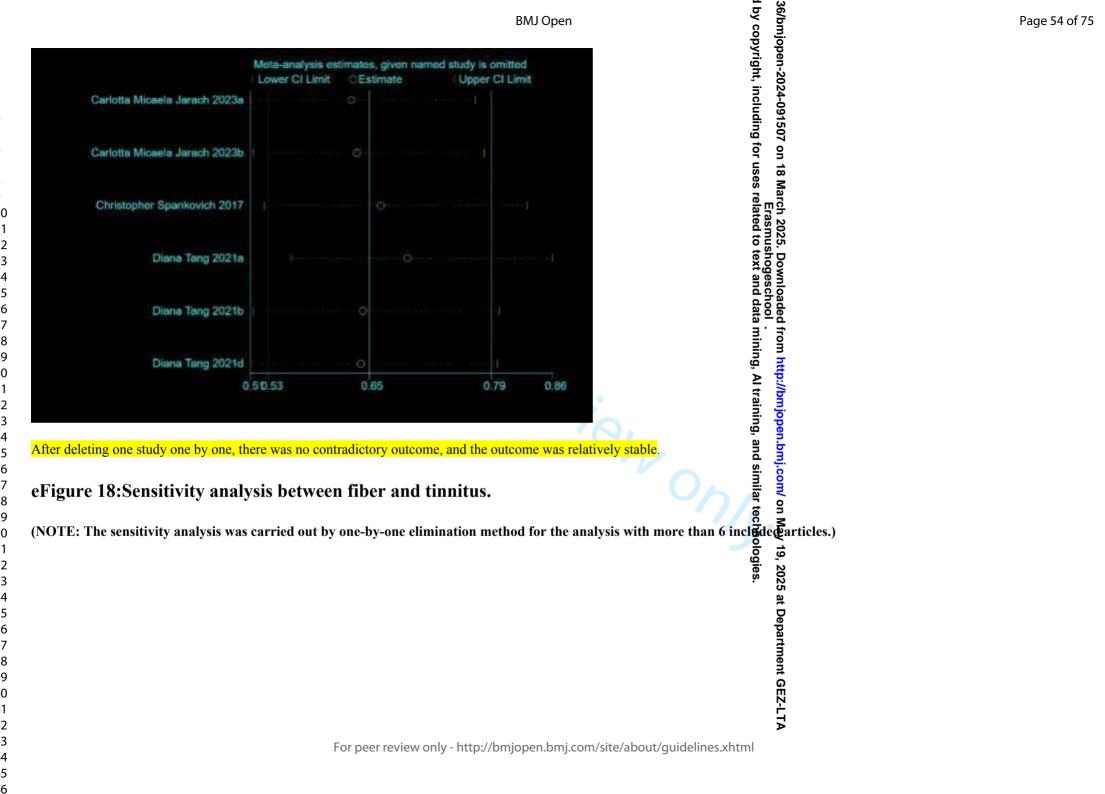
. metan logrr selog	,,				njopen-2024 opyright, in		
Study	ES	[95% Conf.	Interval]	% Weight	24-09150 includin		
Carlotta Micaela Ja		0.429	1.645	0.03	7 on 18		
Ooh Young Lee 2018	1.003	0.992	1.014	99.77	18 Ma		
Milena Tomanic 2020	1.210	0.950	1.541	0.21	rch 20 Eras elatec		
I-V pooled ES	1.003	0.992	1.014	100.00)25. Dov mushog to text		
Actually: water: OR=1.003, [95%C]	· +	<i>(</i>) _			/hload escho		
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Figure 15: Forest Plot SI	howing the Asso	ciation Between	dairy and tinniti	.21	ne -		
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Black diamonds are the estimated po	ooled odd ratio (OR) fo		10.		.tp:///	ortioned to stu	udies in the meta- a
Black diamonds are the estimated po	ooled odd ratio (OR) fo		10.		.tp:///	ortioned to stu	udies in the meta- a
Black diamonds are the estimated po	ooled odd ratio (OR) fo	or each random-effects	meta-analysis; Red box		tp://bpht app	ortioned to stu	udies in the meta- a
Black diamonds are the estimated polary: OR=0.83, [95%CI 0.77,0.89]	pooled odd ratio (OR) fo , I ² =0% p<0.00001		10.	sizes reflect the relat	tp://bpht app	ortioned to stu	udies in the meta- a
Black diamonds are the estimated polaring: OR=0.83, [95%CI 0.77,0.89] Study or Subgroup log[Odd: Abby McCormack 2014a -0.1	pooled odd ratio (OR) for p<0.00001 s Ratio SE Weight SE Weig	Odds Ratio N, Fixed, 95% CI 0.85 [0.75, 0.95]	meta-analysis; Red box Odds Ratio	sizes reflect the relat	tp://bpht app	ortioned to stu	udies in the meta- a
Black diamonds are the estimated polarity: OR=0.83, [95%CI 0.77,0.89] Study or Subgroup log[Odd: Abby McCormack 2014a -0.1 Abby McCormack 2014b -0.2	pooled odd ratio (OR) for p<0.00001 s Ratio SE Weight	Odds Ratio N, Fixed, 95% Cl	meta-analysis; Red box Odds Ratio	sizes reflect the relat	tp://bpht app	ortioned to stu	udies in the meta- a
Study or Subgroup log[Odd: Abby McCormack 2014a Abby McCormack 2014b Abby McCormack 2014b Abby McCormack 2014c -0.1	pooled odd ratio (OR) for p<0.00001 s Ratio SE Weight 655144 0.0603033 41.2 390169 0.0582753 44.1 310283 0.1153023 11.3	Odds Ratio N, Fixed, 95% Cl	meta-analysis; Red box Odds Ratio	sizes reflect the relat	tp://bpht app	ortioned to stu	udies in the meta- a
Study or Subgroup log[Odd: Abby McCormack 2014a -0.1 Abby McCormack 2014b -0.2 Abby McCormack 2014c -0.1 Christopher Spankovich 2017	s Ratiol SE Weig 655144 0.0603033 41.2 390169 0.0582753 44.1 310283 0.1153023 11.3 -0.0101 0.2069 3.5	Odds Ratio N, Fixed, 95% CI 0.85 [0.75, 0.95] 0.79 [0.70, 0.88] 0.88 [0.70, 1.10] 0.99 [0.66, 1.49]	meta-analysis; Red box Odds Ratio	sizes reflect the relat	tp://bpht app	ortioned to stu	udies in the meta- a
Slack diamonds are the estimated polarity: OR=0.83, [95%CI 0.77,0.89] Study or Subgroup log[Odd: Abby McCormack 2014a -0.1 Abby McCormack 2014b -0.2 Abby McCormack 2014c -0.1 Christopher Spankovich 2017 Total (95% CI)	s Ratio SE Weight SE Weigh	Odds Ratio N, Fixed, 95% CI 0.85 [0.75, 0.95] 0.79 [0.70, 0.88] 0.88 [0.70, 1.10]	Odds Ratio	sizes reflect the relat	app. .tp://brogopen.bmj.com/ on May 19, .v., Al trauning, and similar technolog	ortioned to stu	udies in the meta- a
Study or Subgroup logIOdd: Abby McCormack 2014b Abby McCormack 2014b Abby McCormack 2014b Abby McCormack 2014c -0.1	s Ratio SE Weight SE Weigh	Odds Ratio ht IV, Fixed, 95% CI % 0.85 [0.75, 0.95] % 0.79 [0.70, 0.88] % 0.88 [0.70, 1.10] % 0.99 [0.66, 1.49] 0.83 [0.77, 0.89]	Odds Ratio	sizes reflect the relat	app tp://bmgopen.bmj.com/ on May , Al training, and similar techno	ortioned to stu	udies in the meta- a
Study or Subgroup log[Odd: Abby McCormack 2014a -0.1 Abby McCormack 2014b -0.2 Abby McCormack 2014c -0.1 Christopher Spankovich 2017 Total (95% CI) Heterogeneity: Chi² = 1.89, df = 3 (P = 0.60	s Ratio SE Weight SE Weigh	Odds Ratio ht IV, Fixed, 95% CI % 0.85 [0.75, 0.95] % 0.79 [0.70, 0.88] % 0.88 [0.70, 1.10] % 0.99 [0.66, 1.49] 0.83 [0.77, 0.89]	Odds Ratio N, Fixed, 95%	sizes reflect the relat	app. .tp://brogopen.bmj.com/ on May 19, .v., Al trauning, and similar technolog	ortioned to stu	udies in the meta- a
Study or Subgroup log[Odd: Abby McCormack 2014a -0.1 Abby McCormack 2014b -0.2 Abby McCormack 2014c -0.1 Christopher Spankovich 2017 Total (95% CI) Heterogeneity: Chi² = 1.89, df = 3 (P = 0.60	s Ratio SE Weight SE Weigh	Odds Ratio ht IV, Fixed, 95% CI % 0.85 [0.75, 0.95] % 0.79 [0.70, 0.88] % 0.88 [0.70, 1.10] % 0.99 [0.66, 1.49] 0.83 [0.77, 0.89]	Odds Ratio N, Fixed, 95%	sizes reflect the relat	app.ttp://brigopen.bmj.com/ on May 19, 2025 at Dep tp://brigopen.bmj.com/ on May 19, 2025 at Dep , Al training, and similar technologies.	ortioned to stu	udies in the meta- a
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Study or Subgroup log[Odd: Abby McCormack 2014a -0.1 Abby McCormack 2014b -0.2 Abby McCormack 2014c -0.1 Christopher Spankovich 2017 Total (95% CI) Heterogeneity: Chi² = 1.89, df = 3 (P = 0.60	s Ratio SE Weight SE Weigh	Odds Ratio ht IV, Fixed, 95% CI % 0.85 [0.75, 0.95] % 0.79 [0.70, 0.88] % 0.88 [0.70, 1.10] % 0.99 [0.66, 1.49] 0.83 [0.77, 0.89]	Odds Ratio N, Fixed, 95%	sizes reflect the relat	app. .tp://brogopen.bmj.com/ on May 19, .v., Al trauning, and similar technolog	ortioned to stu	udies in the meta- a
Study or Subgroup log[Odd: Abby McCormack 2014a -0.1 Abby McCormack 2014b -0.2 Abby McCormack 2014c -0.1 Christopher Spankovich 2017 Total (95% CI) Heterogeneity: Chi² = 1.89, df = 3 (P = 0.60	s Ratiol SE Weig 655144 0.0603033 41.2 390169 0.0582753 44.1 310283 0.1153023 11.3 -0.0101 0.2069 3.5 100.6	Odds Ratio Mt N, Fixed, 95% CI 0.85 [0.75, 0.95] 0.79 [0.70, 0.88] 0.88 [0.70, 1.10] 0.99 [0.66, 1.49] 7. 0.83 [0.77, 0.89]	Odds Ratio N, Fixed, 95%	ci	apple ttp://brigopen.bmj.com/ on May 19, 2025 at Department GEZ-LTA , Al trayning, and similar technologies.	ortioned to stu	udies in the meta- a

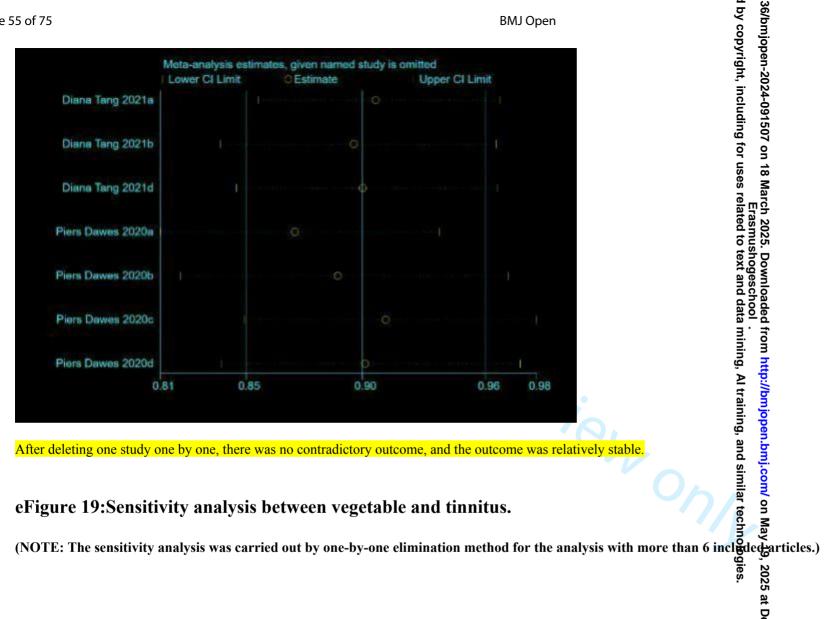
		-		Odds Ratio	Odds Ratio
Study or Subgroup	log[Odds Ratio]	SE	Weight	IV, Fixed, 95% CI	IV, Fixed, 95% CI
Abby McCormack 2014a	-0.1655144	0.0603033	41.2%	0.85 [0.75, 0.95]	
Abby McCormack 2014b	-0.2390169	0.0582753	44.1%	0.79 [0.70, 0.88]	-
Abby McCormack 2014c	-0.1310283	0.1153023	11.3%	0.88 [0.70, 1.10]	-
Christopher Spankovich 2017	-0.0101	0.2069	3.5%	0.99 [0.66, 1.49]	-
Total (95% CI)			100.0%	0.83 [0.77, 0.89]	•
Heterogeneity: Chi2 = 1.89, df =	3 (P = 0.60); P = 09	6		-	05 07 15 0
Test for overall effect: Z = 4.87 (0.5 0.7 1 1.5 2 Favours [experimental] Favours [control]

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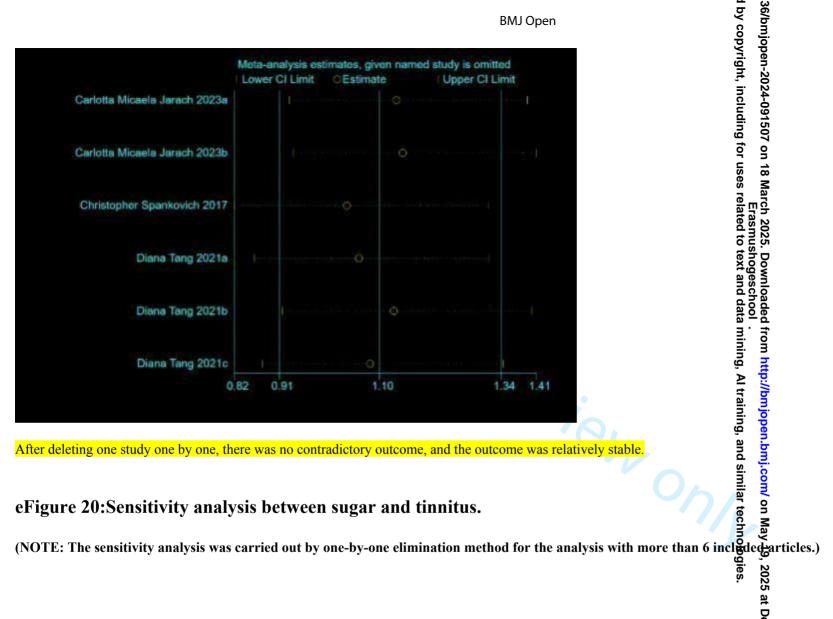
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bby McCormack 2014	4.50			41.62	on 1 for u
abby McCormack 2014a				44.21	8 Ma
abby McCormack 2014b	A CONTRACTOR OF THE CONTRACTOR				arch Er rela
Christopher Spankovi		0.631			36/bmjopen-2024-091507 on 18 March 2025. Downlo Erasmushogesc by copyright, including for uses related to text and
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NOTE: The sensitivity analysis	was carried out by	one-by-one eliminat	tion method for the	analysis with more than	n 6 incladeda
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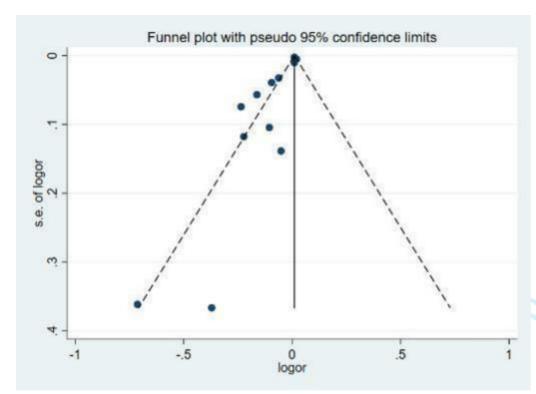


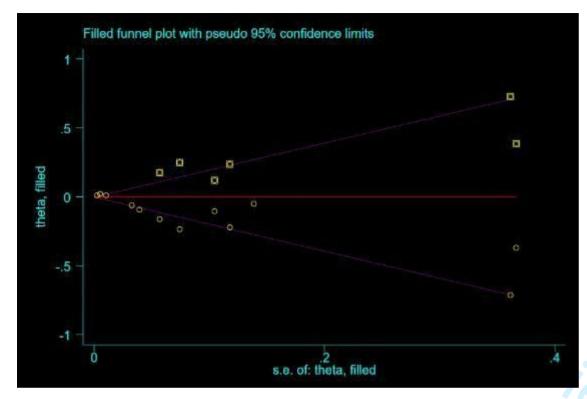
2025 at Department GEZ-LTA



After deleting one study one by one, there was no contradictory outcome, and the outcome was relatively stable.

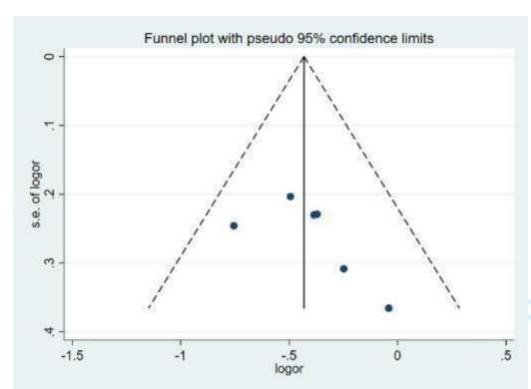
eFigure 21:Publication bias and Egger test on caffeine





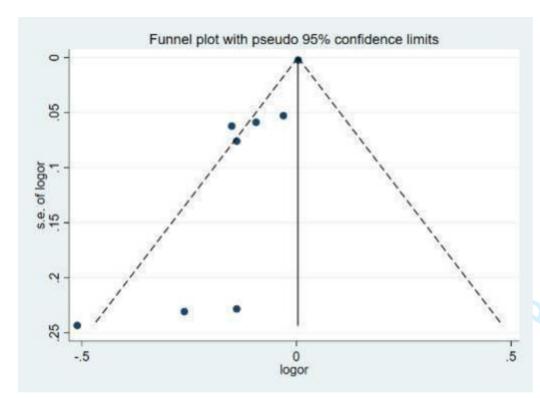
Cut and complement method tips, there was no significant publication bias.

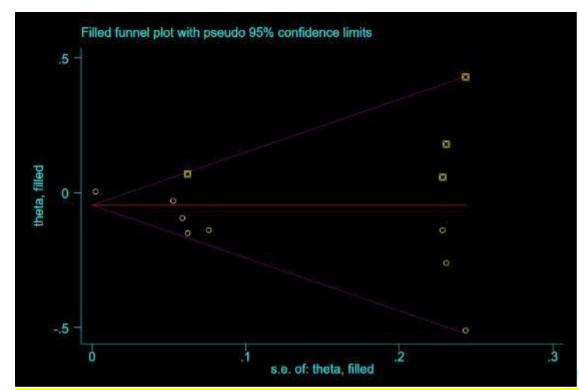
eFigure 22: Publication bias and Egger test on fruit



Egger test: Fruit p=0.205>0.05, there was no significant publication bias.

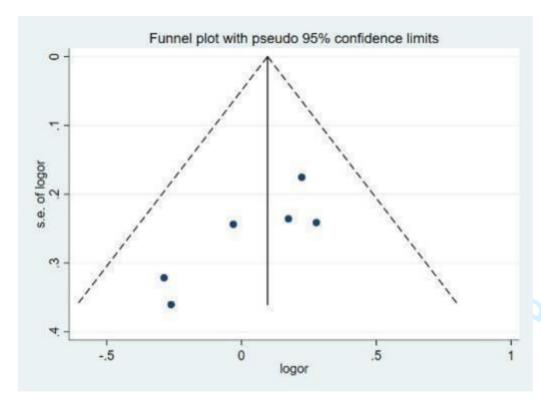
eFigure 23:Publication bias and Egger test on fiber

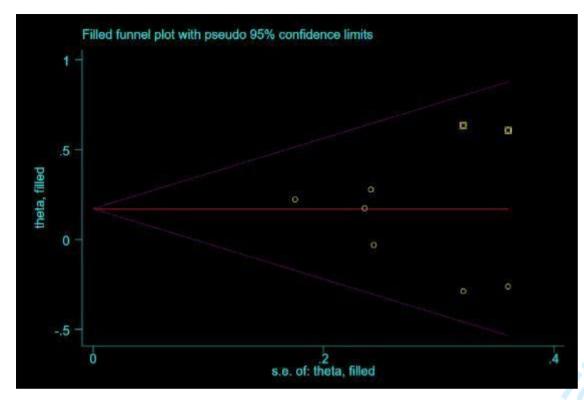




Egger test: Fruit p=0.006<0.05. Cut and complement method tips, there was no significant publication bias.

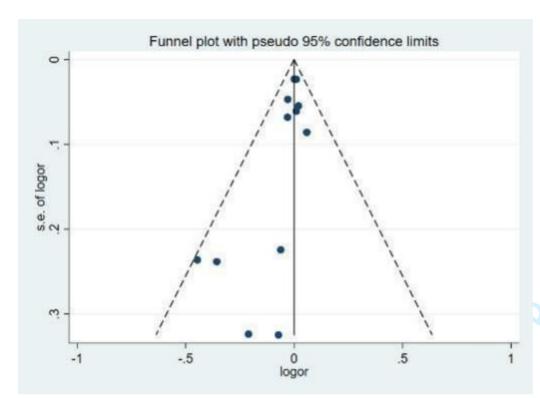
eFigure 24:Publication bias and Egger test on vegetable.

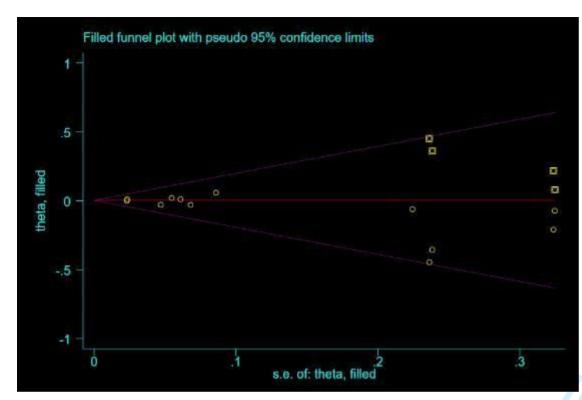




Egger test: Fruit p=0.041<0.05. Cut and complement method tips, there was no significant publication bias.

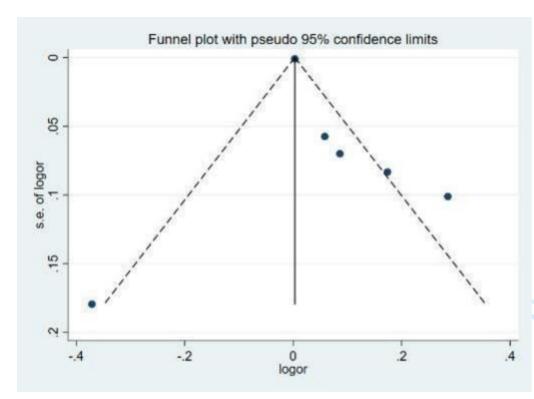
eFigure 25:Publication bias and Egger test on sugar.





Egger test: Fruit p=0.035<0.05. Cut and complement method tips, there was no significant publication bias.

eFigure 26:Publication bias and Egger test on fat.



Egger test: Fat p=0.306>0.05, there was no significant publication bias.

eTable 1. Meta-analysis of Observational Studies in Epidemiology (MOOSE) Checklist

Item No.	Recommendation Recommendation	Reported on Page No
Repo	rting of background should include	
1	% X	3-5
2	Hypothesis statement	3-5
3	Description of study outcome(s)	3-5
4	Type of exposure or intervention used	3-5
5	Hypothesis statement Description of study outcome(s) Type of exposure or intervention used Type of study designs used Study population	-
6	Study population	5
Repo	rting of search strategy should include	
7	Qualifications of searchers (eg. librarians and investigators)	6
8	Search strategy, including time period included in the synthesis and keywords	6
9	Effort to include all available studies, including contact with authors	6, 7
10	Databases and registries searched	5,6
11	Search software used, name and version, including special features used (eg, explosion)	8
12	Use of hand searching (eg, reference lists of obtained articles)	6
13	List of citations located and those excluded, including justification	6, Fig 1
14	Method of addressing articles published in languages other than English	7
15	Method of handling abstracts and unpublished studies	6, 7
16	Description of any contact with authors	-
Repo	rting of methods should include	
	p:	

9 of 75	BMJ Open BMJ Open BMJ Open Description of relevance or appropriateness of studies assembled for assessing the hypothesis to be testedding Pationals for the selection and coding of data (e.g. sound clinical principles or convenience)	
17	Description of relevance or appropriateness of studies assembled for assessing the hypothesis to be tested 6. 91.	8
18	Rationale for the selection and coding of data (eg, sound clinical principles or convenience)	7-8
19	Documentation of how data were classified and coded (eg, multiple raters, blinding and interrater reliability)	7
20	Assessment of confounding (eg. comparability of cases and controls in studies where appropriate)	7
21	Assessment of study quality, including blinding of quality assessors, stratification or regression on possible study results Assessment of heterogeneity Description of statistical methods (eg, complete description of fixed or random effects models, justification of available for the	7
22	Assessment of heterogeneity	8
23	Description of statistical methods (eg, complete description of fixed or random effects models, justification of whether the	8
	Description of statistical methods (eg, complete description of fixed or random effects models, justification of her the chosen models account for predictors of study results, dose-response models, or cumulative meta-analysis) and the detail to be replicated	
24	Provision of appropriate tables and graphics	Table 1, Fig 1
Repo		
25	Graphic summarizing individual study estimates and overall estimate	Fig 2, Table 1
26	Table giving descriptive information for each study included	eTable2
27	Results of sensitivity testing (eg, subgroup analysis)	eFig16-20
28	Indication of statistical uncertainty of findings rting of discussion should include	10,11
Repo	Results of sensitivity testing (eg, subgroup analysis) Indication of statistical uncertainty of findings rting of discussion should include	
29	Quantitative assessment of bias (eg, publication bias)	eFig21-26
30	Justification for exclusion (eg, exclusion of non-English language citations)	Fig 1
31	Assessment of quality of included studies	eTable 5
Repo	rting of conclusions should include	
32	Consideration of alternative explanations for observed results	11-19
33	Generalization of the conclusions (ie, appropriate for the data presented and within the domain of the literature ஷ்ல்iew)	11-19

34	Guidelines for future research	oen- /righ	19-20
35	Disclosure of funding source	2024 ht, in	1
Table 2	2: Dietary risk ratio associated with tinnitus	-091507 on 18 cluding for us	

eTable 2: Dietary risk ratio associated with tinnitus

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eTable 2: Dietary risk ra	atio associated with	h tinnitus			14-091507 on 18 March 2025. Downloaded from 4 Erasmushogeschool 4 Irasmushogeschool 4 Irasmushogeschool 4 Irasmushogeschool 4 Irasmushogeschool 4 Irasmushogeschool 4 Irasmushogeschool 6 Irasmushogeschool 6 Irasmushogeschool 6 Irasmushogeschool 7 Irasmushogeschool 8 Irasmushogeschool 9 Irasmushogeschool 8 Irasmushogeschool 9	
Carlotta Micaela Jarach 2023a	scarce	butter	tinnitus	0.98	0. 3 4 ar	1.77
Carlotta Micaela Jarach 2023b	normal use or high use	butter	tinnitus	0.46	ch 202 Erasm lated t	0.93
Diana Tang 2021a	2nd quartile (>188.4–231.7)	carbohydrate	tinnitus	0.74	25. Dow iushog to text	1.17
Diana Tang 2021b	3rd quartile (231.8– 280.8)	carbohydrate	tinnitus	0.739	nloade eschoo an d ida	1.15
Diana Tang 2021c	4th quartile (>280.8– 577.7)	carbohydrate	tinnitus	0.55	of fron	0.9
Doh Young Lee 2018	direct	carbohydrate	tinnitus	1.001	0.899	1.001
Piers Dawes 2020a	quintile 2	Carbohydrate	tinnitus	1.03	0 .2 4 💆	1.14
Piers Dawes 2020b	quintile 3	Carbohydrate	tinnitus	0.98	0 3 8	1.11
Piers Dawes 2020c	quintile 4	Carbohydrate	tinnitus	0.99	0.36 op 0.378 en	1.14
Piers Dawes 2020d	quintile 5	Carbohydrate	tinnitus	0.93	0 3 8 🚆	1.1
Carlotta Micaela Jarach 2023a	50-100g/week	cheese	tinnitus	1.29	0.343	2.67
Carlotta Micaela Jarach 2023b	100+g/week	cheese	tinnitus	0.85	0 \$ 6 8	1.58
Abby McCormack 2014	direct	coffee	Transient tinnitus	1.020	1.0000	1.031
Abby McCormack 2014a	direct	coffee	Persistent tinnitus	1.010	1.600	1.020
Abby McCormack 2014b	direct	coffee	Bothersome tinnitus	1.010	0. 3 90.2	1.031
Carlotta Micaela Jarach 2023a	2nd quartile (850- 1749mg)	coffee	tinnitus	0.49	1.60 m May 19, 2025 0.50 ologies.	0.99
Carlotta Micaela Jarach 2023b	3rd quartile (≥1750mg)	coffee	tinnitus	0.69	0.34 a	1.43
Jordan T Glicksman 2014a	150-299 mg/day	coffee	tinnitus	0.94	0.88	1
Jordan T Glicksman 2014b	300-449 mg/day	coffee	tinnitus	0.91	0.88 parti	0.98
Jordan T Glicksman 2014c	450-599 mg/day	coffee	tinnitus	0.85	0.76	0.95

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Jordan T Glicksman 2014d	600+ mg/day	coffee	tinnitus	0.79	0 3 8 pen	0.91
Sang-Youp Lee 2018	Age 19–39 (Daily)	coffee	tinnitus	0.8	-2024- ht; ²³ nc	1
Sang-Youp Lee 2018	Age 40-64 (Daily)	coffee	tinnitus	0.9	0.23 91	1.1
Sang-Youp Lee 2018	Age >65 (Daily)	coffee	tinnitus	0.95	0 4 2	1.24
Abby McCormack 2014	direct	dairy	Transient tinnitus	0.847	0.952 🖺	0.752
Abby McCormack 2014a	direct	dairy	Persistent tinnitus	0.787	0. § 85 &	0.704
Abby McCormack 2014b	direct	dairy	Bothersome tinnitus	0.877	1. % 99 Mar	0.699
Christopher Spankovich 2017	direct	dairy	Persistent tinnitus	0.99	0호[[]	1.50
Carlotta Micaela Jarach 2023a	16-19	diversity	tinnitus	0.53	202 0: [1	1
Carlotta Micaela Jarach 2023b	≥20	diversity	tinnitus	0.47	Marich 2025. Downloaded from 9 Ezasmushogeschool 9 Ezasmushogeschool 9 Seletated to text and dataminit	0.9
Abby McCormack 2014	direct	egg	Transient tinnitus	1.031	1. F48 8	0.926
Abby McCormack 2014a	direct	egg	Persistent tinnitus	1.149	1. 2 9	1.031
Abby McCormack 2014b	direct	egg	Bothersome tinnitus	0.901	1. 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0.719
Carlotta Micaela Jarach 2023a	1/week	eggs	tinnitus	0.99	0.31 ±	1.92
Carlotta Micaela Jarach 2023b	2+/week	eggs	tinnitus	0.54	0 ₹ 9 🖁	1
Christopher Spankovich 2017	direct	fat	Persistent tinnitus	0.69	0 9 9 🚆	0.99
Doh Young Lee 2018	direct	fat	tinnitus	1.003	1. 🔁 1 🕌	1.005
Piers Dawes 2020a	quintile 2	fat	tinnitus	1.06	0.25 3	1.19
Piers Dawes 2020b	quintile 3	fat	tinnitus	1.09	0 3 5	1.25
Piers Dawes 2020c	quintile 4	fat	tinnitus	1.19	1.001 m.bmj.	1.40
Piers Dawes 2020d	quintile 5	fat	tinnitus	1.33	1.89 🛂	1.62
Diana Tang 2021a	2nd quartile (>17.8– 23.8)	fiber	tinnitus	0.6		0.96
Diana Tang 2021b	3rd quartile (>23.8– 30.6)	fiber	tinnitus	0.87	mitar technologies	1.37
Diana Tang 2021d	4th quartile (>30.6– 89.3)	fiber	tinnitus	0.77	y 19, 2025 at lologies. 0.999	1.21
Doh Young Lee 2018	direct	fiber	tinnitus	1.004	0.999 م	1.008
Piers Dawes 2020a	quintile 2	fiber	tinnitus	0.97	0.87	1.07
Piers Dawes 2020b	quintile 3	fiber	tinnitus	0.91	0.81	1.02
Piers Dawes 2020c	quintile 4	fiber	tinnitus	0.86	0.76 m 0.75 nt	0.97
Piers Dawes 2020d	quintile 5	fiber	tinnitus	0.87	0.75 n	1.01

			BMJ Open		36/bmjopen	
Abby McCormack 2014	direct	fish	Transient tinnitus	0.980	0. 2 ≨0 en	1.020
Abby McCormack 2014a	direct	fish	Persistent tinnitus	0.910	0. \$ 70 🖄	0.940
Abby McCormack 2014b	direct	fish	Bothersome tinnitus	1.080	0.890	1.160
Carlotta Micaela Jarach 2023a	300g/week	fish	tinnitus	1.19	091507 00ing 1	2.38
Carlotta Micaela Jarach 2023b	≥450g/week	fish	tinnitus	0.75	0.41 55	1.4
Carlotta Micaela Jarach 2023a	900-1050g/week	fruit	tinnitus	0.96	0.97 9	1.97
Carlotta Micaela Jarach 2023b	≥1200g/week	fruit	tinnitus	0.78	0 .5 3 18 1	1.44
Christopher Spankovich 2017	direct	fruit	Persistent tinnitus	0.61	0 <u>.3</u> 1 Mar	0.91
Diana Tang 2021a	2nd quartile (>3.6– 6.2)	fruit	tinnitus	0.47	ch 202 Erasm lated i	0.76
Diana Tang 2021b	3rd quartile (>6.2– 9.7)	fruit	tinnitus	0.68	5. Doviushog	1.06
Diana Tang 2021d	4th quartile (>9.7– 43.9)	fruit	tinnitus	0.69	18 March 2025. Downloaded	1.08
Carlotta Micaela Jarach 2023a	scarce	margarine	tinnitus	1.35	0 a S a	7.43
Carlotta Micaela Jarach 2023b	normal use or high use	margarine	tinnitus	1.4	from http://pip.75	9.98
Carlotta Micaela Jarach 2023a	300g/week	meat	tinnitus	1.49	0 .7 5 =	2.94
Carlotta Micaela Jarach 2023b	≥450g/week	meat	tinnitus	0.97	0. 5 1 🕏	1.85
Christopher Spankovich 2017	direct	meat	Persistent tinnitus	1.01	0. 3 .2 😽	1.65
Carlotta Micaela Jarach 2023a	2nt quartile (1-6 cops/week)	milk	tinnitus	0.68	mjopen.bmj.com	1.52
Carlotta Micaela Jarach 2023b	3rt quartile (7+ cops/week)	milk	tinnitus	0.85	nj.com/on 0.mila@1.001	1.55
Doh Young Lee 2018	direct	protein	tinnitus	1.002	1.001 9	1.004
Piers Dawes 2020a	quintile 2	protein	tinnitus	1.02	0.\$42 €	1.14
Piers Dawes 2020b	quintile 3	protein	tinnitus	1.01	0 9 9 19	1.13
Piers Dawes 2020c	quintile 4	protein	tinnitus	0.97	0 9 5 2	1.11
Piers Dawes 2020d	quintile 5	protein	tinnitus	1.06	0.59 0.59	1.26
Abby McCormack 2014	direct	sugar	Transient tinnitus	1.000	0.952	1.042
Abby McCormack 2014a	direct	sugar	Persistent tinnitus	1.010	0.971 த	1.064
Abby McCormack 2014b	direct	sugar	Bothersome tinnitus	0.971	0.885 artime	1.064

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Carlotta Micaela Jarach 2023a	2nt quartile (1-7 spoon/week)	sugar	tinnitus	0.93	pen-2024-091507 on yright, incfuding∑or	1.75
Carlotta Micaela Jarach 2023b	3rt quartile (8+ spoon/week)	sugar	tinnitus	0.81	24-091: 0 udi	1.53
Diana Tang 2021a	2nd quartile (>91.0– 120.1)	sugar	tinnitus	0.64	24-091507 on 18 M	1.01
Diana Tang 2021b	3rd quartile (>120.1– 154.0)	sugar	tinnitus	0.94	18 Mai uses r	1.47
Diana Tang 2021c	4th quartile (>154.0– 350.8)	sugar	tinnitus	0.7	Aarch 2025. Downloa Erasmushegesch s related to text and	1.12
Piers Dawes 2020a	quintile 2	sugar	tinnitus	1.02	0.325.5	1.14
Piers Dawes 2020b	quintile 3	sugar	tinnitus	1.01	0 % 6 0	1.13
Piers Dawes 2020c	quintile 4	sugar	tinnitus	0.97	0.33.65.0	1.11
Piers Dawes 2020d	quintile 5	sugar	tinnitus	1.06	Oga Oga Oga	1.26
Christopher Spankovich 2017	direct	variety	Persistent tinnitus	0.95	Oataon	1.5
Carlotta Micaela Jarach 2023a	900-1050g/week	vegetable	tinnitus	0.77	038 6	1.56
Carlotta Micaela Jarach 2023b	≥1200g/week	vegetable	tinnitus	0.75	(654 ₹	1.41
Christopher Spankovich 2017	direct	vegetable	Persistent tinnitus	1.25	(<u>A</u>)	1.79
Diana Tang 2021a	2nd quartile (>7.2– 9.7)	vegetable	tinnitus	1.32	Agtraxaning, and	2.11
Diana Tang 2021b	3rd quartile (>9.7– 12.3)	vegetable	tinnitus	0.97	0.50	1.56
Diana Tang 2021c	4th quartile (>12.3– 54.5)	vegetable	tinnitus	1.19	0 3 5 3 3 3 3 3 3 3 3 3 3	1.89
Abby McCormack 2014	direct	vegetable and fruit	Transient tinnitus	1.000	1.0000	1.010
Abby McCormack 2014a	direct	vegetable and fruit	Persistent tinnitus	1.010	ا فِي 1.0000	1.010
Abby McCormack 2014b	direct	vegetable and fruit	Bothersome tinnitus	1.010	1. 6 00 3	1.020
Carlotta Micaela Jarach 2023a	>1 liter/per day	water	tinnitus	0.84		1.65
Doh Young Lee 2018	direct	water	tinnitus	1.003	0.992 5	1.014

Table 3. Evalua	tion of Risl	c of Bias U s	sing Nev	vcastle-(Scale (I	NOS) fo	r Observ	š a	es
Study	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Tasm 2021	Total
Carlotta Micaela Jarach 2023	*	*	*	*	*	*	*	*	rch 2825. Downloaded from http://bmjopen Erasmushogeschool elatedto text and data mining, Al training,	8
Diana Tang 2021	*	*	*		*	*	*	*	load scho nd da	8
Milena Tomanic 2020	*	*	*		0,		*		led from	4
Piers Dawes 2020	*	*	*		*	*	*		n ht	6
Sang-Yeon Lee 2019	*	*	*		*	*	*		tp://bn Al tra	6
Doh Young Lee 2018	*	*	*		*	*	*		njopen ining,	6
Sang-Youp Lee 2018	*	*	*		*	*	*		.bmj.c	6
Christopher Spankovich 2017	*	*	*		*	*	*	0)	n.bmj.com/ on May 19, 2025 and similar technologies.	6
Abby McCormack 2014	*	*	*		*	*	*		May 1	6
Jordan T Glicksman 2014	*	*	*		*	*	*		9, 202 * ogies.	7

eTable 4. Literature screening process

75 of 75	BMJ Open	36/bmjo _l
eTable 4. Literature screening process		36/bmjopen-2024-09150g of the distribution of
Title	Author	Include
The Role of Diet in Tinnitus Onset: A Hospital-Based Case-Control Study from Italy.	Carlotta Micaela Jarach 2023	18 Warch 2025. ⊞ Eraşmus use≼related to t
Associations between intake of dietary flavonoids and the 10-year incidence of tinnitus in older adults.	Diana Tang 2022	h 2025. Trasmus ated to
Dietary Fibre Intake and the 10-Year Incidence of Tinnitus in Older Adults.	Diana Tang 2021	. Downlo shogesc text and
Relationship Between Diet, Tinnitus, and Hearing Difficulties.	Piers Dawes 2020	oaded Speol d'Arata
Association of Chocolate Consumption with Hearing Loss and Tinnitus in Middle-Aged People Based on the Korean National Health and Nutrition Examination Survey 2012-2013.	Sang-Yeon Lee 2019	d from http://bm.jopec.bmj.com/ on May 19,2025 at Department 日 日 日 日 日 日 日 日 日 日 日 日 日 日 日 日 日 日 日
Relationship Between Diet and Tinnitus: Korea National Health and Nutrition Examination Survey.	Doh Young Lee 2018	o://bonjo Al traini
Association of Coffee Consumption with Hearing and Tinnitus Based on a National Population-Based Survey	Sang-Youp Lee 2018	pegan Egyand
Relationship between dietary quality, tinnitus and hearing level: data from the national health and nutrition examination survey, 1999-2002.	Christopher Spankovich 2017	j.com/ E Isim⊓lar
Association of dietary factors with presence and severity of tinnitus in a middle-aged UK population.	Abby McCormack 2014	onoMay E te≿hno
A prospective study of caffeine intake and risk of incident tinnitus	Jordan T. Glicksman 2014	19 <u>,2</u> 02 E blogites.
The effect of MemoVigor 2 on recent-onset idiopathic tinnitus: a randomized double-blind placebo-controlled clinical trial.	Dimitrios G Balatsouras 2024	5 at Der N
The effects of dietary and physical activity interventions on tinnitus symptoms: An RCT.	Ümüş Özbey-Yücel 2023	oartmen N

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Effectiveness of Tinnitan Duo in Subjective Tinnitus with Emotional Affectation: A Prospective, Interventional Study.	Jennifer Knäpper 2023	pen-202 yright, i
Hyperlipidemia and its relation with tinnitus: Cross-sectional approach.	A Musleh 2022	
Diet Quality and the Risk of Impaired Speech Reception Threshold in Noise: The UK Biobank cohort	Humberto Yévenes-Briones 2022	open-2024-091507 on o yright, including for u
The effect of caffeine on tinnitus: Randomized triple-blind placebo- controlled clinical trial.	Alleluia Lima Losno Ledesma 2021	n 18 Ma r uses r
The effects of diet and physical activity induced weight loss on the severity of tinnitus and quality of life: A randomized controlled trial.	Ümüş Özbey-Yücel 2021	rch 202 Erasm elated
Dietary Factors and Tinnitus among Adolescents.	Milena Tomanic 2020	6 40 C
Restriction of salt, caffeine and alcohol intake for the treatment of Ménière's disease or syndrome.	Kiran Hussain 2018	ownloa ogesch ext and
The effect of supplemental dietary taurine on tinnitus and auditory discrimination in an animal model.	Thomas J Brozoski 2010	
Low energy diet and intracranial pressure in women with idiopathic intracranial hypertension: prospective cohort study.	Alexandra J Sinclair 2010	ded from http://bmjopen.bmj ook. data mining, Al training, and
Caffeine abstinence: an ineffective and potentially distressing tinnitus therapy.	Lindsay St Claire 2010	//bmjoper
The role of endogenous Antisecretory Factor (AF) in the treatment of Meniere's Disease: A two-year follow-up study. Preliminary results.	Pasquale Viola 2020	en.bmj g, and s
Caffeine intake and Meniere's disease: Is there relationship?	Inés Sánchez-Seller 2018	<u>s</u> Nog
Tinnitus features according to caffeine consumption.	Ricardo Rodrigues Figueiredo 2021	j.com/ op May 19, 202 Smilar technologies.
The Influence of Diet on Tinnitus Severity: Results of a Large-Scale, Online Survey	Steven C. Marcrum 2022	ay 19, 202 nologies.