Supplementary material

Associations between physical activity and health outcomes in clinical and non-clinical populations: A systematic meta-umbrella review

Zagorianakou N et al, 2023

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**PRISMA 2020 Checklist**

| **Section and Topic** | **Item #** | **Checklist item** | **Location where item is reported** |
| --- | --- | --- | --- |
| **TITLE** | | |  |
| Title | 1 | Identify the report as a systematic review. | P 1 |
| **ABSTRACT** | | |  |
| Abstract | 2 | See the PRISMA 2020 for Abstracts checklist. | See below |
| **INTRODUCTION** | | |  |
| Rationale | 3 | Describe the rationale for the review in the context of existing knowledge. | P 4 |
| Objectives | 4 | Provide an explicit statement of the objective(s) or question(s) the review addresses. | P 5 |
| **METHODS** | | |  |
| Eligibility criteria | 5 | Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses. | P 6 |
| Information sources | 6 | Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted. | P 5-6 |
| Search strategy | 7 | Present the full search strategies for all databases, registers and websites, including any filters and limits used. | P 6 |
| Selection process | 8 | Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process. | P 6 |
| Data collection process | 9 | Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process. | P6 |
| Data items | 10a | List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect. | P8 |
| 10b | List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information. | P7-8 |
| Study risk of bias assessment | 11 | Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process. | P8 |
| Effect measures | 12 | Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results. | P8 |
| Synthesis methods | 13a | Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)). | P8 |
| 13b | Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions. | P9 |
| 13c | Describe any methods used to tabulate or visually display results of individual studies and syntheses. | P8-9 |
| 13d | Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used. |  |
| 13e | Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression). | NA |
| 13f | Describe any sensitivity analyses conducted to assess robustness of the synthesized results. | P9 |
| Reporting bias assessment | 14 | Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases). | P9 |
| Certainty assessment | 15 | Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome. | P7 |
| **RESULTS** | | |  |
| Study selection | 16a | Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram. | P9 |
| 16b | Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded. | P9; Suppl material |
| Study characteristics | 17 | Cite each included study and present its characteristics. | P9-10 |
| Risk of bias in studies | 18 | Present assessments of risk of bias for each included study. | P10 |
| Results of individual studies | 19 | For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots. | P11-14 |
| Results of syntheses | 20a | For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies. | P11-14 |
| 20b | Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect. | P11-14 |
| 20c | Present results of all investigations of possible causes of heterogeneity among study results. | P11-14 |
| 20d | Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results. | P11-14 |
| Reporting biases | 21 | Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed. | P11-14 |
| Certainty of evidence | 22 | Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed. | P11-14 |
| **DISCUSSION** | | |  |
| Discussion | 23a | Provide a general interpretation of the results in the context of other evidence. | P14-17 |
| 23b | Discuss any limitations of the evidence included in the review. | P17 |
| 23c | Discuss any limitations of the review processes used. | P17 |
| 23d | Discuss implications of the results for practice, policy, and future research. | P17 |
| **OTHER INFORMATION** | | |  |
| Registration and protocol | 24a | Provide registration information for the review, including register name and registration number, or state that the review was not registered. | P 5 |
| 24b | Indicate where the review protocol can be accessed, or state that a protocol was not prepared. | P5 |
| 24c | Describe and explain any amendments to information provided at registration or in the protocol. | NA |
| Support | 25 | Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review. | P 18 |
| Competing interests | 26 | Declare any competing interests of review authors. | P18 |
| Availability of data, code and other materials | 27 | Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review. | P18 |

# **PRISMA 2020 for Abstracts Checklist**

| **Section and Topic** | **Item #** | **Checklist item** | **Reported (Yes/No)** |
| --- | --- | --- | --- |
| **TITLE** | | |  |
| Title | 1 | Identify the report as a systematic review. | Yes |
| **BACKGROUND** | | |  |
| Objectives | 2 | Provide an explicit statement of the main objective(s) or question(s) the review addresses. | Yes |
| **METHODS** | | |  |
| Eligibility criteria | 3 | Specify the inclusion and exclusion criteria for the review. | Yes |
| Information sources | 4 | Specify the information sources (e.g. databases, registers) used to identify studies and the date when each was last searched. | Yes |
| Risk of bias | 5 | Specify the methods used to assess risk of bias in the included studies. | Yes |
| Synthesis of results | 6 | Specify the methods used to present and synthesise results. | Yes |
| **RESULTS** | | |  |
| Included studies | 7 | Give the total number of included studies and participants and summarise relevant characteristics of studies. | Yes |
| Synthesis of results | 8 | Present results for main outcomes, preferably indicating the number of included studies and participants for each. If meta-analysis was done, report the summary estimate and confidence/credible interval. If comparing groups, indicate the direction of the effect (i.e. which group is favoured). | Yes |
| **DISCUSSION** | | |  |
| Limitations of evidence | 9 | Provide a brief summary of the limitations of the evidence included in the review (e.g. study risk of bias, inconsistency and imprecision). | No |
| Interpretation | 10 | Provide a general interpretation of the results and important implications. | Yes |
| **OTHER** | | |  |
| Funding | 11 | Specify the primary source of funding for the review. | NA |
| Registration | 12 | Provide the register name and registration number. | NA |

**PRIOR checklist**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Section**  Topic | | | **#** | | **Item** | **Location reported** | |
| **TITLE** | | | | | |  | |
| Title | | | 1 | | Identify the report as an overview of reviews. | Pg 1 | |
| **ABSTRACT** | | | | | |  | |
| Abstract | | | 2 | | Provide a comprehensive and accurate summary of the purpose, methods, and results of the overview of reviews. | Pg 2-3 | |
| **INTRODUCTION** | | | | | |  | |
| Rationale | | | 3 | | Describe the rationale for conducting the overview of reviews in the context of existing knowledge. | Pg 4 | |
| Objectives | | | 4 | | Provide an explicit statement of the objective(s) or question(s) addressed by the overview of reviews. | Pg 5 | |
| **METHODS** | | | | | |  | |
| Eligibility criteria | | | 5a | | Specify the inclusion and exclusion criteria for the overview of reviews. If supplemental primary studies were included, this should be stated, with a rationale. | Pg 5-6 | |
| 5b | | Specify the definition of ‘systematic review’ as used in the inclusion criteria for the overview of reviews. | Pg 6 | |
| Information sources | | | 6 | | Specify all databases, registers, websites, organizations, reference lists, and other sources searched or consulted to identify systematic reviews and supplemental primary studies (if included).  Specify the date when each source was last searched or consulted. | Pg 5-6 | |
| Search strategy | | | 7 | | Present the full search strategies for all databases, registers and websites, such that they could be reproduced. Describe any search filters and limits applied. | Pg 5-6 | |
| Selection process | | | 8a | | Describe the methods used to decide whether a systematic review or supplemental primary study (if included) met the inclusion criteria of the overview of reviews. | Pg 6-7 | |
| 8b | | Describe how overlap in the populations, interventions, comparators, and/or outcomes of systematic reviews was identified and managed during study selection. | Pg 6 and 8 | |
| Data collection process | | | 9a | | Describe the methods used to collect data from reports. | Pg 7 | |
| 9b | | If applicable, describe the methods used to identify and manage primary study overlap at the level  of the comparison and outcome during data collection. For each outcome, specify the method used to illustrate and/or quantify the degree of primary study overlap across systematic reviews. | Pg 8 and suppl material | |
| 9c | | If applicable, specify the methods used to manage discrepant data across systematic reviews during data collection. | NA | |
| Data items | | | 10 | | List and define all variables and outcomes for which data were sought. Describe any assumptions made and/or measures taken to identify and clarify missing or unclear information. | Pg 8 | |
| Risk of bias assessment | | | 11a | | Describe the methods used to *assess* risk of bias or methodological quality of the included systematic reviews. | Pg 8 | |
| 11b | | Describe the methods used to *collect* data on (from the systematic reviews) and/or *assess* the risk of bias of the primary studies included in the systematic reviews. Provide a justification for instances where flawed, incomplete, or missing assessments are identified but not re-assessed. | Pg 7 suppl Tables | |
| 11c | | Describe the methods used to *assess* the risk of bias of supplemental primary studies (if included). | NA | |
| Synthesis methods | | | 12a | | Describe the methods used to summarize or synthesize results and provide a rationale for the choice(s). | Pg 8 | |
| 12b | | Describe any methods used to explore possible causes of heterogeneity among results. | NA | |
| 12c | | Describe any sensitivity analyses conducted to assess the robustness of the synthesized results. | Pg 7 | |
| Reporting bias assessment | | | 13 | | Describe the methods used to *collect* data on (from the systematic reviews) and/or *assess* the risk of bias due to missing results in a summary or synthesis (arising from reporting biases at the levels of the systematic reviews, primary studies, and supplemental primary studies, if included). | Pg 7-9 | |
| Certainty assessment | | | 14 | | Describe the methods used to *collect* data on (from the systematic reviews) and/or *assess* certainty (or confidence) in the body of evidence for an outcome. | Pg 7-9 | |
| **RESULTS** | | | | | |  | |
| Systematic review and supplemental primary study selection | | | 15a | | Describe the results of the search and selection process, including the number of records screened, assessed for eligibility, and included in the overview of reviews, ideally with a flow diagram. | Figure 1, Pg 9 | |
| 15b | | Provide a list of studies that might appear to meet the inclusion criteria, but were excluded, with the main reason for exclusion. | Suppl Tables | |
| **Section**  Topic | **#** | | **Item** | | | **Location**  **reported** |
| Characteristics of systematic reviews and  supplemental primary studies | 16 | | Cite each included systematic review and supplemental primary study (if included) and present its characteristics. | | | Pg 9, suppl table 2 |
| Primary study overlap | 17 | | Describe the extent of primary study overlap across the included systematic reviews. | | | Pg10 suppl table 3 |
| Risk of bias in systematic reviews, primary studies, and  supplemental primary studies | 18a | | Present assessments of risk of bias or methodological quality for each included systematic review. | | | Pg 10-11, Tables, suppl material |
| 18b | | Present assessments (*collected* from systematic reviews or *assessed* anew) of the risk of bias of  the primary studies included in the systematic reviews. | | | Suppl tables 4-8 |
| 18c | | Present assessments of the risk of bias of supplemental primary studies (if included). | | | NA |
| Summary or synthesis of results | 19a | | For all outcomes, summarize the evidence from the systematic reviews and supplemental primary studies (if included). If meta-analyses were done, present for each the summary estimate and its  precision and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect. | | | Pg 11-14, Tables, |
| 19b | | If meta-analyses were done, present results of all investigations of possible causes of  heterogeneity. | | | NA |
| 19c | | If meta-analyses were done, present results of all sensitivity analyses conducted to assess the  robustness of synthesized results. | | | NA |
| Reporting biases | 20 | | Present assessments (*collected* from systematic reviews and/or *assessed* a new) of the risk of bias due to missing primary studies, analyses, or results in a summary or synthesis (arising from reporting biases at the levels of the systematic reviews, primary studies, and supplemental primary  studies, if included) for each summary or synthesis assessed. | | | NA |
| Certainty of  evidence | 21 | | Present assessments (*collected* or *assessed* anew) of certainty (or confidence) in the body of  evidence for each outcome. | | | Pg 11-14, Tables, Suppl material |
| **DISCUSSION** | | | | | |  |
| Discussion | 22a | | Summarize the main findings, including any discrepancies in findings across the included systematic reviews and supplemental primary studies (if included). | | | Pg 14-18 |
| 22b | | Provide a general interpretation of the results in the context of other evidence. | | | Pg 14-18 |
| 22c | | Discuss any limitations of the evidence from systematic reviews, their primary studies, and supplemental primary studies (if included) included in the overview of reviews. Discuss any  limitations of the overview of reviews methods used. | | | Pg 17 |
| 22d | | Discuss implications for practice, policy, and future research (both systematic reviews and  primary research). Consider the relevance of the findings to the end users of the overview of reviews, e.g., healthcare providers, policymakers, patients, among others. | | | Pg 14-15 |
| **OTHER INFORMATION** | | | | | |  |
| Registration and protocol | 23a | | Provide registration information for the overview of reviews, including register name and registration number, or state that the overview of reviews was not registered. | | | Pg 5 |
| 23b | | Indicate where the overview of reviews protocol can be accessed, or state that a protocol was not  prepared. | | | Not prepared and registered; Pg 5 |
| 23c | | Describe and explain any amendments to information provided at registration or in the protocol.  Indicate the stage of the overview of reviews at which amendments were made. | | | NA |
| Support | 24 | | Describe sources of financial or non-financial support for the overview of reviews, and the role of  the funders or sponsors in the overview of reviews. | | | Pg 18 |
| Competing  interests | 25 | | Declare any competing interests of the overview of reviews' authors. | | | Pg 18 |
| Author information | 26a | | Provide contact information for the corresponding author. | | | Pg 1 |
| 26b | | Describe the contributions of individual authors and identify the guarantor of the overview of  reviews. | | | Pg 18 |
| Availability of data and other materials | 27 | | Report which of the following are available, where they can be found, and under which conditions they may be accessed: template data collection forms; data collected from included systematic  reviews and supplemental primary studies; analytic code; any other materials used in the overview of reviews. | | | Pg 18 |

# **Supplementary Table 1.** Articles excluded with reasons

|  |  |  |  |
| --- | --- | --- | --- |
| **First Author** | **Year** | **Title** | **Reason for exclusion** |
| Dipietro | 2019 | Benefits of Physical Activity during Pregnancy and Postpartum: An Umbrella Review. | Qualitive synthesis |
| Dipietro | 2019 | Physical Activity, Injurious Falls, and Physical Function in Aging: An Umbrella Review. | Qualitive synthesis |
| Erickson | 2019 | Physical Activity, Cognition, and Brain Outcomes: A Review of the 2018 Physical Activity Guidelines. | Qualitive synthesis |
| Kraus | 2019 | E+G6ffects of Physical Activity in Knee and Hip Osteoarthritis: A Systematic Umbrella Review. | Qualitive synthesis |
| Kraus | 2019 | Physical Activity, All-Cause and Cardiovascular Mortality, and Cardiovascular Disease. | Qualitive synthesis |
| Gielen | 2021 | Nutritional interventions to improve muscle mass, muscle strength, and physical performance in older people: an umbrella review of systematic reviews and meta-analyses. | Not physical activity as exposure |
| Pescatello | 2019 | Physical Activity to Prevent and Treat Hypertension: A Systematic Review. | Qualitive synthesis |
| Barbosa | 2020 | Physical Activity and Academic Achievement: An Umbrella Review. | No health outcomes |
| Toi | 2020 | Preventive Role of Diet Interventions and Dietary Factors in Type 2 Diabetes Mellitus: An Umbrella Review. | Not physical activity as exposure |
| Collado-Mateo | 2021 | Key Factors Associated with Adherence to Physical Exercise in Patients with Chronic Diseases and Older Adults: An Umbrella Review. | No health outcomes |
| Kouiti | 2022 | Preventing Gestational Diabetes Mellitus by Improving Healthy Diet and/or Physical Activity during Pregnancy: An Umbrella Review. | No GRADE descriptive data per outcome |
| Bangsbo | 2019 | Copenhagen Consensus statement 2019: physical activity and ageing. | Not an umbrella review |
| Girgis | 2020 | Physical therapy for tendinopathy: An umbrella review of systematic reviews and meta-analyses. | Not physical activity as exposure |
| Beckwée | 2019 | Exercise Interventions for the Prevention and Treatment of Sarcopenia. A Systematic Umbrella Review. | No GRADE descriptive data per outcome |
| Brown | 2022 | Australian guidelines for physical activity in pregnancy and postpartum. | Not an umbrella review |
| Kline | 2021 | Physical activity and sleep: An updated umbrella review of the 2018 Physical Activity Guidelines Advisory Committee report | No GRADE descriptive data per outcome |
| Zanghì | 2022 | The Practice of Physical Activity on Psychological, Mental, Physical, and Social Wellbeing for Breast-Cancer Survivors: An Umbrella Review. | Qualitive synthesis |
| Lum | 2022 | Interventions to Improve Child Physical Activity in the Early Childhood Education and Care Setting: An Umbrella Review. | Not physical activity as exposure |
| Mannocci | 2020 | Are There Effective Interventions to Increase Physical Activity in Children and Young People? An Umbrella Review. | Not physical activity as exposure |
| Lam | 2021 | Associations between the built environment and obesity: an umbrella review. | Not physical activity as exposure |
| Bonaccorsi | 2020 | Impact of the Built Environment and the Neighborhood in Promoting the Physical Activity and the Healthy Aging in Older People: An Umbrella Review. | Not physical activity as exposure |
| Horodyska | 2015 | Implementation conditions for diet and physical activity interventions and policies: an umbrella review | Policy article |
| Horodyska | 2015 | Good practice characteristics of diet and physical activity interventions and policies: an umbrella review. | Policy article |
| Aleksovska | 2019 | Biological determinants of physical activity across the life course: a "Determinants of Diet and Physical Activity" (DEDIPAC) umbrella systematic literature review | Policy article |
| Jadczak | 2018 | Effectiveness of exercise interventions on physical function in community-dwelling frail older people: an umbrella review of systematic reviews | No effect size reported |
| Neil-Sztramko | 2022 | Community-based group physical activity and/or nutrition interventions to promote mobility in older adults: an umbrella review | No effect size reported |
| Garcia | 2022 | Barriers and facilitators of domain-specific physical activity: a systematic review of reviews. | Not physical activity as exposure |
| O'Donoghue G | 2018 | Socio-economic determinants of physical activity across the life course: A "DEterminants of DIet and Physical ACtivity" (DEDIPAC) umbrella literature review | Not physical activity as exposure |
| D'Amore | 2021 | Determinants of physical activity in older adults: an umbrella review protocol. | Protocol |
| Carlin | 2017 | A life course examination of the physical environmental determinants of physical activity behaviour: A "Determinants of Diet and Physical Activity" (DEDIPAC) umbrella systematic literature review. | Not physical activity as exposure |
| Barbosa Filho | 2016 | Promoting physical activity for children and adolescents in low- and middle-income countries: An umbrella systematic review: A review on promoting physical activity in LMIC. | Not physical activity as exposure |
| López-Ortiz | 2023 | Effects of physical activity and exercise interventions on Alzheimer's disease: an umbrella review of existing meta-analyses | No GRADE descriptive data per outcome |
| Condello | 2017 | Behavioral determinants of physical activity across the life course: a "DEterminants of DIet and Physical ACtivity" (DEDIPAC) umbrella systematic literature revie | Not physical activity as exposure |
| Jaeschke | 2017 | Socio-cultural determinants of physical activity across the life course: a 'Determinants of Diet and Physical Activity' (DEDIPAC) umbrella systematic literature review | Not physical activity as exposure |
| Cortis | 2017 | Psychological determinants of physical activity across the life course: A "DEterminants of DIet and Physical ACtivity" (DEDIPAC) umbrella systematic literature review. | Not physical activity as exposure |
| Safron | 2011 | Micro-environmental characteristics related to body weight, diet, and physical activity of children and adolescents: a systematic umbrella review | Not physical activity as exposure |
| Craike | 2018 | Interventions to improve physical activity among socioeconomically disadvantaged groups: an umbrella review | Not physical activity as exposure |
| Torres | 2018 | Umbrella and Systematic Review Methodology to Support the 2018 Physical Activity Guidelines Advisory Committee | Methodological paper |
| Pieters | 2020 | An Update of Systematic Reviews Examining the Effectiveness of Conservative Physical Therapy Interventions for Subacromial Shoulder Pain. | Only systematic reviews |
| Zhang | 2022 | The impact of interventions in the built environment on physical activity levels: a systematic umbrella review | Not physical activity as exposure |
| de Keijzer | 2022 | The effect of flywheel training on strength and physical capacities in sporting and healthy populations: An umbrella review | No effect size reported |
| Visser | 2022 | Effectiveness and characteristics of physical fitness training on aerobic fitness in vulnerable older adults: an umbrella review of systematic reviews | Qualitive synthesis |
| Grabovac | 2020 | Human Immunodeficiency Virus Infection and Diverse Physical Health Outcomes: An Umbrella Review of Meta-analyses of Observational Studies | Not association of interest |
| Conn | 2016 | Effectiveness of Interventions to Increase Physical Activity Among Minority Populations: An Umbrella Review | Not physical activity as exposure |
| Rodríguez-González | 2023 | Effectiveness of interventions using apps to improve physical activity, sedentary behavior and diet: An umbrella review | Not physical activity as exposure |
| Fiedler | 2020 | Key facets to build up eHealth and mHealth interventions to enhance physical activity, sedentary behavior and nutrition in healthy subjects - an umbrella review | Not physical activity as exposure |
| Arts | 2023 | Correlates of Physical Activity in 0- to 5-year-olds: A Systematic Umbrella Review and Consultation of International Researchers | No effect size reported |
| Dafny | 2023 | Cardiac rehabilitation, physical activity, and the effectiveness of activity monitoring devices on cardiovascular patients: An umbrella review of systematic reviews | No effect size reported |
| Puggina | 2018 | Policy determinants of physical activity across the life course: a 'DEDIPAC' umbrella systematic literature review | Policy article |
| Sanabria-Martínez | 2019 | Effects of physical exercise during pregnancy on mothers' and neonates' health: a protocol for an umbrella review of systematic reviews and meta-analysis of randomised controlled trials. | Protocol |
| Falandry | 2020 | Interventions to improve physical performances of older people with cancer before complex medico-surgical procedures: Protocol for an umbrella review of systematic reviews and meta-analyses | Protocol |
| Hoelscher | 2022 | Prevention of Pediatric Overweight and Obesity: Position of the Academy of Nutrition and Dietetics Based on an Umbrella Review of Systematic Reviews | Not association of interest |
| Bigarella | 2022 | Exercise for depression and depressive symptoms in older adults: an umbrella review of systematic reviews and Meta-analyses | No GRADE descriptive data per outcome |
| Aleksovska | 2020 | Correction to: Biological determinants of physical activity across the life course: a "Determinants of Diet and Physical Activity" (DEDIPAC) umbrella systematic literature review. | Correction note |
| Andrade | 2022 | Effects of Exercise in the Treatment of Alzheimer's Disease: An Umbrella Review of Systematic Reviews and Meta-Analyses | Full text not retrieved |
| Pescatello | 2021 | Best Practices for Meta-Reviews in Physical Activity and Health Research: Insights from the Physical Activity Guidelines for Americans Advisory Committee Scientific Report | Methodological paper |
| Catalan-Matamoros | 2016 | Exercise improves depressive symptoms in older adults: An umbrella review of systematic reviews and meta-analyses | No effect size reported |
| Siqueira | 2019 | Effects of exercise in people with haemophilia: An umbrella review of systematic reviews and meta-analyses | No GRADE descriptive data per outcome |
| Fausto | 2023 | An umbrella systematic review of the effect of physical exercise on mental health of women in menopause | No effect size reported |
| Jadczak | 2016 | Effectiveness of exercise interventions on physical function in community-dwelling frail older people: an umbrella review protocol | Protocol |
| Andrade | 2020 | What we already know about the effects of exercise in patients with fibromyalgia: An umbrella review | No GRADE descriptive data per outcome |
| Bidonde | 2014 | Exercise for adults with fibromyalgia: an umbrella systematic review with synthesis of best evidence | No GRADE descriptive data per outcome |
| Križaj | 2022 | The chronic effects of eccentric exercise interventions in different populations: an umbrella review | Only systematic reviews |
| Heslehurst | 2020 | The effectiveness of smoking cessation, alcohol reduction, diet and physical activity interventions in changing behaviours during pregnancy: A systematic review of systematic reviews. | Only systematic reviews |
| Watterson | 2018 | Effectiveness of maternal dietary interventions for improving mother and infant health outcomes: an umbrella review protocol. | Not physical activity as exposure |

**Supplementary Table 2.** Overall characteristics of the umbrella reviews included in the current study.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Umbrella review first author, year** | **Type of physical activity** | **Definition** | **Health condition** | **SRs and MAs (n)/MA included in meta-UR** | **Primary studies (n) of included MAs/study design** | **Sample size (k)** | **Health outcomes**  **tested (n)** | **Evidence reviewed (years range)** | **Databases search** | **Grading**  **method** | **AMSTAR 2/**  **Funding was reported** |
| Demurtas et al., 2020 | Physical activity and exercise (mixed type) | Physical activity:Any  movement that is carried out by the skeletal muscles that requires energy.  Exercise: A planned,  structured, repetitive and intentional movement intended to  improve or maintain physical fitness | Mild cognitive impairment and Dementia | 18 MAs and 9 SRs without MA /11 MA | 117/Observational studies (prospective cohort and case control) and RCTs | 25,250 | Activities of daily living, Depressive symptoms, Behavioral and Psychological Symptoms, Risk of falls, Number of falls, Global cognition, Executive function, Attention, Delayed Memory, Short-term memory, Visospatial executive function (11) | 2010-2019 | Medline/Ovid, PsychINFO, CINHAL, EMBASE, and Cochrane Library | GRADE | Low  /No |
| Martinez-Vizcaino et al., 2022 | Physical activity and exercise | NR | Pregnancy | 23 MAs/23 MAs | 63/RCTs | 48,028 | Gestational Diabetes Mellitus,  Gestational hypertension, Gestational Hypertension and Preeclampsia,  Obesity (4) | 2011-2020 | PubMed, Embase, Web of Science, Cohrane Library, Epistimonikos,  SPORTDiscus, clinicaltrials.gov, and  PROSPERO | GRADE | High/Yes  (funded) |
| Shepherd-Banigan et al., 2017 | Yoga/tai chi/qigong | Combinations of physical exercises and bodily positions or postures, breath control practices, and meditation | Peri and post-menopausal women | 1 SR/1 MA | 6/ RCTs | 935 | Flash severity,  Psychological symptoms (2) | 2007-2014 | Medline PubMed  Cochrane Library, EMBASE, and CINAHL | GRADE | Low/Yes (funded) |
| Singh et al., 2023 | All known modes of physical activity interventions | Any bodily movement  produced by the contraction of skeletal muscles that results in a  substantial increase in caloric requirements over resting energy  expenditure | Any adult population aged ≥18 years  -healthy adults  -mental health disorders  -chronic diseases | 97 SRs and MAs/1 MA | 6/RCTs | >73,500  (508) | Psychological distress (1) | 2001-2021 | CINAHL, Cochrane, Embase,  Medline, Emcare, ProQuest Health and Medical Complete,  ProQuest Nursing and Allied Health Source, PsycINFO, Scopus,  Sport Discus, EBSCOhost and Web of Science | Oxford centre for Evidence-Based Medicine | Moderate /Yes (funded) |
| Jiang et al., 2020 | Exercise (aerobic training, resistance training, Yoga, Tai Chi, Qigong, etc) | NR | Breast cancer  patients | 24 SRs And MAs/12 MAs | 214/RCTs | 156 to 3418 | Fatigue (1) | 2006-2019 | PubMed, Web of Science, Cochrane Library, CINAHL, Embase, China National Knowledge Infrastructure (CNKI), Wanfang, China Biomedical Literature, (CBMdisc), and VIP database | GRADE | Moderate/Yes (not funded) |
| Cillekens et al., 2020 | Leisure physical activity and occupational PA | NR | Any population | 36 SRs and MAs/17 MAs | 217/Observational studies (cohort, case–control, cross-sectional) and  RCTS | NR | Any type of cancer  Mortality,  Cardiovascular disease,  Diabetes type II, Osteoarthritis, Sleep quality, Hypertension (6) | 2004-2019 | PubMed, Web of Science, Embase, CINAHL, and Sport discus | GRADE | Moderate/Yes (funded) |
| Zhang et al., 2022 | Exercise | NR | Chronic kidney disease | 31 MAs/10 MAs | NR/RCTs and quasi-experimental studies | 106 to 874 | Blood pressure, health related quality of life, fatigue, muscle strength (4) | 2011-2021 | Pubmed, Embase, Cochrane Library, and Wed of science | GRADE | Low/Yes |
| Lesinski et al., 2022 | Resistance training | NR | Healthy youth (≤ 18 years) | 14 MAs/ 4 MAs | 43/ (CT and RCT) | 11, 235 | Muscle strength, Muscle power (2) | 1996-2019 | PubMed, Web of Science, and Cochrane Library | GRADE | Critically Low/Yes (funded) |
| Valenzuela et al., 2021 | Physical activity and sports practice | NR | Any population | 11 MAs/1 MAs | 20/ Observational studies | 205,710 (9113) | Atrial fibrillation (1) | 2009-2014 | PubMed, Sport discus, and Cochrane Library | Ioannidis Criteria | Low/Yes (funded) |
| Rezende et al., 2017 | Any type of physical activity and recreational physical activity approaches | NR | General healthy population | 19 MAs/13 MAs | 541/Observational studies (cohort and case control) | 77,0000 | Cancer incidence,  Cancer mortality (2) | 2005-2017 | Web of Science  Medline, and  Cochrane Library | Ioannidis Criteria | High/Yes (funded) |
| Zhang et al., 2023 | Physical activity | NR | Any adult population | 70 MAs/4 MAs | 34/Observational and RCTs | 111,689 | Incident dementia and cognitive impairment (2) | 2010-2020 | PubMed, Embase, CINAHL, and Cochrane Library | Ioannidis Criteria | Moderate/Yes (funded) |
| Markozannes et al., 2015 | Occupational activity | NR | Any adult population | 14 MAs/1 MAs | 13/ Observational studies (case control and cohort) | 3,861,201 | Incidence and/or mortality of prostate cancer (1) |  | Medline | Ioannidis Criteria | Moderate/Yes (funded) |
| Trott et al., 2022 | Overall physical activity | NR | People with type 2 diabetes | 13 MAs/ (1 MA) | 15/ Observational (Case control/ cross- sectional and cohort) | 56,752 | Diabetic retinopathy (1) | 2011-2018 | Embase, Pubmed, and CINAHL | Ioannidis Criteria | Moderate/Yes (not funded) |
| Hou et al., 2023 | Aerobic exercise combined with resistance exercise | NR | Lung cancer patients | 6 SRs and 7 MAs/1 MA | 2 to 10 / Observational and RCTs | 53 to 553 | Fatigue (1) | 2014-2021 | PubMed, EMBASE, Web of Science, and Cochrane Library | GRADE | Low/NR |
| Bellou et al., 2015 | Physical activity | NR | Any population | 38 MAs/1 MA | 5/ Observational studies (case control and cohort) | NR | Risk of Parkinson disease (1) | 2010-2015 | PubMed | Ioannidis Criteria | Low/ Yes (not funded) |
| Bellou et al., 2017 | Physical activity | NR | Any population | 43 MAs/2 MAs | 30/ Observational studies (case control and cohort) | 35,974 | Risk of Dementia (1) | 2008-2016 | PubMed | Ioannidis Criteria | Low /Yes (not funded) |

Notes: MAs=Meta-analysis; NR=Not reported; RCTs=Randomized controlled trials; SRs=Systematic review

# **Supplementary Table 3.** Citation matrix and the corrected covered area (CCA) method for component meta-analyses included in umbrella-reviews

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Umbrella reviews | | | | | | | | | | | | | | | |
| Meta-analysis study included per umbrella review | Demurtas et al., 2020 | Cillekens et al, 2020 | Zhang et al, 2022 | Singh et al, 2022 | Lesinski et al, 2020 | Zhang et al., 2023 | Trott et al., 2022 | De Rezende et al, 2017 | Valenzuela et al, 2021 | Bellou et al., 2017 | Bellou et al., 2015 | Jiang et al., 2020 | Markozannes et al, 2016 | Hou et al., 2023 | Martínez-Vizcaíno et al, 2022 | Shepherd-Banigan et al, 2017 |
| Almeida (2019) | x |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Burton (2015) | x |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Cummisuli (2017) | x |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Groot (2016) | x |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Jia (2019) | x |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Leng (2018) | x |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Lewis (2017) | x |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Lim (2019) | x |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Song (2018) | x |  | x |  |  |  |  |  |  |  |  | x |  |  |  |  |
| Wang (2019) | x |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Zou (2019) | x |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Aune (2015) |  | x |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Chen (2019) |  | x |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Liu (2011) |  | x |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mahmood (2017) |  | x |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| O'Rorke (2010) |  | x |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Pizot (2016) |  | x |  |  |  |  |  | x |  |  |  |  |  |  |  |  |
| Robsahm (2013) |  | x |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Sattelmair (2011) |  | x |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Schmid (2015) |  | x |  |  |  |  |  | x |  |  |  |  |  |  |  |  |
| Wendel-Vos (2004) |  | x |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Yang (2018) |  | x |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Cheema (2014) |  |  | x |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Chung (2016) |  |  | x |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Heiwe (2011) |  |  | x |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Nakamura (2020) |  |  | x |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Pu (2019) |  |  | x |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Salhab (2019) |  |  | x |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Yamamoto (2021) |  |  | x |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Zhang (2019) |  |  | x |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Zuo (2016) |  |  |  | x |  |  |  |  |  |  |  |  |  |  |  |  |
| Behringer (2010) |  |  |  |  | x |  |  |  |  |  |  |  |  |  |  |  |
| Behringer (2011) |  |  |  |  | x |  |  |  |  |  |  |  |  |  |  |  |
| Behm (2017) |  |  |  |  | x |  |  |  |  |  |  |  |  |  |  |  |
| Collins (2019) |  |  |  |  | x |  |  |  |  |  |  |  |  |  |  |  |
| Aarsland (2010) |  |  |  |  |  | x |  |  |  |  |  |  |  |  |  |  |
| Blondell (2014) |  |  |  |  |  | x |  |  |  | x |  |  |  |  |  |  |
| Kivimäki (2019) |  |  |  |  |  | x |  |  |  |  |  |  |  |  |  |  |
| Xu (2017) |  |  |  |  |  | x |  |  |  |  |  |  |  |  |  |  |
| Ren (2019) |  |  |  |  |  |  | x |  |  |  |  |  |  |  |  |  |
| Ayinde (2018) |  |  |  |  |  |  |  | x | x |  |  |  |  |  |  |  |
| Behrens (2013) |  |  |  |  |  |  |  | x |  |  |  |  |  |  |  |  |
| Behrens (2014) |  |  |  |  |  |  |  | x |  |  |  |  |  |  |  |  |
| Behrens (2015) |  |  |  |  |  |  |  | x |  |  |  |  |  |  |  |  |
| Brenner (2016) |  |  |  |  |  |  |  | x |  |  |  |  |  |  |  |  |
| Jochem (2014) |  |  |  |  |  |  |  | x |  |  |  |  |  |  |  |  |
| Keimling (2014) |  |  |  |  |  |  |  | x |  |  |  |  |  |  |  |  |
| Li (2016) |  |  |  |  |  |  |  | x |  |  |  |  |  |  |  |  |
| Niedermaier (2015) |  |  |  |  |  |  |  | x |  |  |  |  |  |  |  |  |
| Psaltopoulou (2016) |  |  |  |  |  |  |  | x |  |  |  |  |  |  |  |  |
| Shi (2015) |  |  |  |  |  |  |  | x |  |  |  |  |  |  |  |  |
| Wolin (2019) |  |  |  |  |  |  |  | x |  |  |  |  |  |  |  |  |
| Beckett (2015) |  |  |  |  |  |  |  |  |  | x |  |  |  |  |  |  |
| Yang (2015) |  |  |  |  |  |  |  |  |  |  | x |  |  |  |  |  |
| Yang (2019) |  |  |  |  |  |  |  |  |  |  |  | x |  |  |  |  |
| Juvet (2017) |  |  |  |  |  |  |  |  |  |  |  | x |  |  |  |  |
| Velthuis (2010) |  |  |  |  |  |  |  |  |  |  |  | x |  |  |  |  |
| McNeely (2006) |  |  |  |  |  |  |  |  |  |  |  | x |  |  |  |  |
| Lipsett (2017) |  |  |  |  |  |  |  |  |  |  |  | x |  |  |  |  |
| Meneses-Echavez (2015) |  |  |  |  |  |  |  |  |  |  |  | x |  |  |  |  |
| Singh (2018) |  |  |  |  |  |  |  |  |  |  |  | x |  |  |  |  |
| Lahart (2018) |  |  |  |  |  |  |  |  |  |  |  | x |  |  |  |  |
| Cramp (2012) |  |  |  |  |  |  |  |  |  |  |  | x |  |  |  |  |
| Dong (2019) |  |  |  |  |  |  |  |  |  |  |  | x |  |  |  |  |
| NR |  |  |  |  |  |  |  |  |  |  |  |  | x |  |  |  |
| NR |  |  |  |  |  |  |  |  |  |  |  |  |  | x |  |  |
| NR |  |  |  |  |  |  |  |  |  |  |  |  |  |  | x |  |
| NR |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | x |
| % Overlap: 5/65=7.7 | | | | | | | | | | | | | | | | |
| CA:70/325=21.5 | | | | | | | | | | | | | | | | |
| CCA;5/260=1.92 | | | | | | | | | | | | | | | | |

**Supplementary AMSTAR 2 items**

1. ﻿Did the research questions and inclusion criteria for the review include the components of PICO/PECO?
2. Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?
3. Did the review authors explain their selection of the study designs for inclusion in the review?
4. Did the review authors use a comprehensive literature search strategy?
5. Did the review authors perform study selection in duplicate?
6. Did the review authors perform data extraction in duplicate?
7. Did the review authors provide a list of excluded studies and justify the exclusions?
8. Did the review authors describe the included studies in adequate detail?
9. Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?
10. Did the review authors report on the sources of funding for the studies included in the review?
11. If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?
12. If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?
13. Did the review authors account for RoB in individual studies when interpreting/ discussing the results of the review?
14. Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?
15. If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?
16. Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?

†Rating overall confidence in the results of the review:

• High: No or one non-critical weakness: the systematic review provides an accurate and comprehensive summary of the results of the available studies that address the question of interest.

• Moderate: More than one non-critical weakness\*: the systematic review has more than one weakness but no critical flaws. It may provide an accurate summary of the results of the available studies that were included in the review.

• Low: One critical flaw with or without non-critical weaknesses: the review has a critical flaw and may not provide an accurate and comprehensive summary of the available studies that address the question of interest.

• Critically low: More than one critical flaw with or without non-critical weaknesses: the review has more than one critical flaw and should not be relied on to provide an accurate and comprehensive summary of the available studies

\*Multiple non-critical weaknesses may diminish confidence in the review, and it may be appropriate to move the overall appraisal down from moderate to low confidence.

# **Supplementary Table 4.** Clinical populations and physical outcomes

| **Umbrella review, author, year** | **Health outcome** | **Health condition** | **Systematic review/meta-analysis (SR/MA), author (year)** | **Type of physical activity** | **Dose or Intensity** | **Primary Studies (n), cases (k)** | **Effect size, (metric)** | **(95% CI)** | **eOR (95%CI)** | **Quality of included SR/MA** | **Level of evidence** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| De Rezende et al, 2017 | All types of cancer mortality | Cancer | Li (2016) | Any physical activity | NR | 25 (40469) | 0.79 (RR) | 0.75 - 0.85 | 0.79 (0.75-0.85) | Moderate | Highly Suggestive (Moderate) |
| De Rezende et al, 2017 | All types of cancer mortality | Cancer | Li (2016) | Other physical activity (non-occupational) | NR | 13 (16408) | 0.75 (RR) | 0.68 - 0.83 | 0.75 (0.68-0.83) | Moderate | Highly Suggestive (Moderate) |
| Demurtas et al., 2020 | Risk of falls | Dementia | Burton (2015) | Physical activity mixed interventions | NR vs Standard Care | 3 (371) | 0.69 (RR) | 0.55 – 0.85 | 0.69 (0.55-0.85) | Low | Moderate |
| Zhang et al, 2022 | Systolic blood pressure | Chronic kidney disease (peridialysis) | Zhang (2019) | Mixed physical activity intervention | NR | 14 (NR) | -0.41 (SMD) | -0.70, - 0.11 | 0.48 (0.28-0.21) | Low | Moderate |
| Trott et al., 2022 | Diabetic retinopathy | Type II diabetes melitus | Ren (2019) | Total physical activity | Moderate | 15 (NR) | 0.95 (RR) | 0.91–0.99 | 0.95 (0.91-0.99) | Moderate | Suggestive (Low) |
| Demurtas et al., 2020 | Activities of daily living | Dementia | Almeida (2019) | Physical activity interventions home based | NR vs Standard Care | 3 (180) | 0.77 (SMD) | 0.17 – 1.37 | 4.03 (1.36-11.94) | Low | Low |
| Demurtas et al., 2020 | Risk of falls | Dementia | Lewis (2017) | Physical activity interventions home based | NR vs Standard Care | 2 (180) | 0.69 (RR) | 0.55 - 0.86 | 0.69 (0.55-0.86) | Low | Low |
| Zhang et al, 2022 | Muscle Strength | Chronic kidney disease (predialysis) | Cheema (2014) | Resistance training | NR | 6 (223) | 1.15 (SMD) | 0.80-1.49 | 8.02 (4.29-14.97) | Moderate | Low |
| Zhang et al, 2022 | Functional capacity | Chronic kidney disease (haemodialysis) | Chung (2016) | Mixed physical activity intervention | NR | 4 (127) | 0.44 (SMD) | 0.09-0.80 | 2.22 (1.17-4.22) | Moderate | Low |
| Zhang et al, 2022 | Systolic blood pressure | Chronic kidney disease (mixed) | Heiwe (2011) | Mixed physical activity intervention | NR | 9 (NR) | 0.25 (SMD) | 0.04 – 0.47 | 0.64 (0.43-0.94) | High | Very Low |
| Zhang et al, 2022 | Systolic blood pressure | Chronic kidney disease (peridialysis) | Yamamoto (2021) | Aerobic exercise | NR | 10 (392) | -0.75 (SMD) | -1.24,- 0.26 | 0.26 (0.11-0.62) | Moderate | Very Low |
| Zhang et al, 2022 | Systolic blood pressure | Chronic kidney disease (haemodialysis) | Pu (2019) | Mixed physical activity intervention | NR | 7 (287) | -0.28 (SMD) | -0.52, -0.05 | 0.60 (0.39-0.92) | Moderate | Very Low |
| Zhang et al, 2022 | Diastolic blood pressure | Chronic kidney disease (haemodialysis) | Pu (2019) | Mixed physical activity intervention | NR | 7 (NR) | -0.32 (SMD) | -0.55,-0.08 | 0.56 (0.37-0.86) | Moderate | Very Low |
| Zhang et al, 2022 | Functional capacity | Chronic kidney disease (predialysis) | Nakamura (2020) | Mixed physical activity intervention | NR | 5 (392) | 1.04 (SMD) | 0.17-1.90 | 6.57 (1.37-31.44) | High | Very low |

Notes: CI=confidence interval, eOR=equivalent odds ratio, MA=meta-analysis, NR=not reported, RR=risk ratio (relative risk), SMD=standardized mean difference, SR=systematic review

# **Supplementary Table 5.** Clinical populations and mental outcomes

| **Umbrella review, author, year** | **Health outcome** | **Health condition** | **Systematic review/meta-analysis (SR/MA), author (year)** | **Type of physical activity** | **Dose or Intensity** | **Primary Studies (n), cases (k)** | **Effect size, (metric)** | **(95% CI)** | **eOR (95%CI)** | **Quality of included SR/MA** | **Level of evidence** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Demurtas et al., 2020 | Delayed memory | Mild cognitive impairment | Leng (2018) | Aerobic exersice intervention | Mean frequency 2.55 times per wk; Mean duration 57 min vs Standard Care | 7 (1313) | 0.26 (SMD) | 0.06 - 0.46 | 1.60 (1.11-2.30) | High | Moderate |
| Demurtas et al., 2020 | Depressive symptoms | Dementia | Song (2018) | Physical activity mixed interventions | NR vs Standard Care | 15 (1409) | -0.18 (SMD) | 0.33 - 0.02 | 0.72 (0.55-0.96) | High | Moderate |
| Demurtas et al., 2020 | Global cognition | Mild cognitive impairment | Zuo (2016) | Mixed physical activity intervention | Mean frequency 2.45 times per wk; Mean duration 54.5 min vs Standard Care | 8 (676) | 0.30 (SMD) | 0.11 - 0.49 | 1.72 (1.22-2.43) | Low | Moderate |
| Singh et al, 2022 | Psychological distress | Breast cancer | Singh (2018) | Yoga | NR vs usual care | 6 (508) | -0.60 (SMD) | -0.78, -0.42 | 0.34 (0.24-0.47) | Critically low | Moderate |
| Jiang et al., 2020 | Fatigue | Breast cancer | Lahart (2018) | Aerobic; resistance; Yoga | NR | 31 (2878) | 0.30 (SMD) | 0.23, 0.38 | 0.58 (0.51-0.67) | Moderate | Moderate |
| Jiang et al., 2020 | Fatigue | Breast cancer | Lahart (2018) | Aerobic; resistance; Yoga; Qigong | End of intervention | 36 (2556) | -0.32 (SMD) | −0.47, −0.18 | 0.56 (0.43-0.73) | Moderate | Moderate |
| Jiang et al., 2020 | Fatigue | Breast cancer | Cramp (2012) | Aerobic; resistance; Yoga; Qigong; Pilates | Follow-up | 37 (2556) | -0.43 (SMD) | −0.60, −0.26 | 0.46 (0.34-0.62) | Moderate | Moderate |
| Jiang et al., 2020 | Fatigue | Breast cancer | Dong (2019) | Aerobic; strength & flexibility; | NR | 18 (1183) | -0.35 (SMD) | −0.51, −0.19 | 0.53 (0.40-0.71) | High | Moderate |
| Jiang et al., 2020 | Fatigue | Breast cancer | Zou (2019) | Yoga | NR | 17 (2183) | -0.83 (SMD) | −1.34, −0.32 | 0.22 (0.09-0.56) | High | Moderate |
| Demurtas et al., 2020 | Attention | Mild cognitive impairment | Zou (2019) | Mind-body intervention | Mean frequency 3.8 times per wk; Mean duration 60 min. vs Standard Care | 5 (365) | 0.39 (SMD) | 0.07 - 0.72 | 2.03 (1.12-3.65) | Low | Low |
| Demurtas et al., 2020 | Executive function | Mild cognitive impairment | Yang (2019) | Mind-body intervention | Mean frequency 3.8 times per wk; Mean duration 60 min. vs Standard Care | 9 (900) | 0.42 (SMD) | 0.21 - 0.63 | 2.14 (1.46-3.13) | Low | Low |
| Jiang et al., 2020 | Fatigue | Breast cancer | Juvet (2017) | Aerobic | NR | 12 (1232) | -0.52 (SMD) | −1.21, −0.13 | 0.39 (0.15-0.98) | Moderate | Low |
| Jiang et al., 2020 | Fatigue | Breast cancer | Velthuis (2010) | Aerobic; resistance; | NR | 25 (3418) | -0.32 (SMD) | −0.49, −0.14 | 0.56 (0.41-0.77) | Moderate | Low |
| Jiang et al., 2020 | Fatigue | Breast cancer | Lipsett 2017 | Aerobic; resistance; aerobic& resistance& stretching | NR | 12 (674) | 0.29 (SMD) | 0.06,0.52 | 0.59 (0.39-0.90) | Moderate | Low |
| Jiang et al., 2020 | Fatigue | Breast cancer | Meneses-Echavez (2015) | Aerobic; resistance; aerobic& resistance; Yoga; Qigong; | NR | 9 (802) | −0.46 (SMD) | −0.79, −0.14 | 0.43 (0.24-0.78) | High | Low |
| Jiang et al., 2020 | Fatigue | Breast cancer | Song (2018) | Aerobic; resistance; stretching; | NR | 9 (1156) | -0.51 (SMD) | −0.81, −0.21 | 0.40 (0.23-0.68) | High | Low |
| Jiang et al., 2020 | Fatigue | Breast cancer | Zou (2019) | Tai Chi | NR | 3 (156) | -0.81 (SMD) | −1.13, −0.48 | 0.23 (0.13-0.42) | High | Low |
| Demurtas et al., 2020 | Global cognition | Mild cognitive impairment | Groot (2016) | Mind body intervention | Mean frequency 3.8 times per wk; Mean duration 60 min. vs Standard Care | 9 (982) | 0.36 (SMD) | 0.20 – 0.52 | 1.92 (1.44-2.56) | Low | Low |
| Demurtas et al., 2020 | Global cognition | Dementia | Cheema (2014) | Mixed physical activity intervention | Mean duration 146 min vs Standard Care | 19 (838) | 0.48 (SMD) | 0.22 - 0.74 | 2.38 (1.49-3.82) | Low | Low |
| Zhang et al, 2022 | Quality of life | Chronic kidney disease (predialysis) | Chung (2016) | Resistance training | NR | 7 (249) | 0.83 (SMD) | 0.51-1.16 | 4.49 (2.49-8.09) | Moderate | Low |
| Zhang et al, 2022 | Quality of life | Chronic kidney disease (haemodialysis) | Zou (2019) | Mixed physical activity intervention | NR | 6 (229) | 0.46 (SMD) | 0.20-0.73 | 2.30 (1.42-3.71) | Moderate | Low |
| Demurtas et al., 2020 | Short-term memory | Mild cognitive impairment | Zou (2019) | Mind body intervention | Mean frequency 3.8 times per wk; Mean duration 60 min. vs Standard Care | 12 (743) | 0.74 (SMD) | 0.57 – 0.91 | 3.82 (2.81-5.19) | Low | Low |
| Demurtas et al., 2020 | Visospatial executive function | Mild cognitive impairment | Song (2018) | Mind body intervention | Mean frequency 3.8 times per wk; Mean duration 60 min. vs Standard Care | 4 (325) | 0.36 (SMD) | 0.07 – 0.64 | 1.92 (1.15-3.21) | Low | Low |
| Zhang et al, 2022 | Fatigue | Chronic kidney disease (haemodialysis) | Pooled from Mas | Mixed physical activity intervention | NR | 3 (139) | -0.85 (SMD) | -1.20, -0.50 | 0.21 (0.11-0.40) | Moderate | Very low |
| Hou et al., 2023 | Fatigue | Lung cancer | McNeely (2006) | Tai chi | 12 weeks | 4 (NR) | -050 (SMD) | -0.72, -0.27 | 0.41 (0.27-0.61) | Critically low | Very low |
| Jiang et al., 2020 | Fatigue | Breast cancer | Wang (2019) | Aerobic; resistance; aerobic& resistance; | NR | 6 (319) | 0.46 (SMD) | 0.23, 0.70 | 0.43 (0.28-0.67) | High | Very low |
| Demurtas et al., 2020 | Global cognition | Mild cognitive impairment | Jia (2019) | Resistance training intervention | Mean frequency 2.5 times per wk; Mean duration 63 min vs Standard Care | 4 (146) | 0.80 (SMD) | 0.29 – 1.31 | 4.25 (1.69-10.71) | Low | Very low |
| Demurtas et al., 2020 | Global cognition | Alzheimer’s disease | Salhab (2019) | Mixed physical activity intervention | Mean frequency 1.8 times per wk; Mean duration 40 min vs Standard Care | 13 (673) | 1.10 (SMD) | 0.65 - 1.64 | 7.32 (2.99-17.94) | Low | Very low |
| Zhang et al, 2022 | Quality of life | Chronic kidney disease (haemodialysis) | Lim (2019) | Aerobic exercise | NR | 5 (282) | 1.02 (SMD) | 0.31-1.73 | 6.34 (1.75-22.90) | Low | Very low |
| Demurtas et al., 2020 | Short-term memory | Mild cognitive impairment | Pooled from Mas | Tai Chi intervention | Mean frequency 3 times per wk; Mean duration 46 min vs Standard Care | 4 (354) | 0.77 (SMD) | 0.45 – 1.09 | 4.03 (2.26-7.19) | High | Very low |

Notes: CI=confidence interval, eOR=equivalent odds ratio, MA=meta-analysis, NR=not reported, RR=risk ratio (relative risk), SMD=standardized mean difference, SR=systematic review

# **Supplementary Table 6.** Healthy populations and health outcomes

| **Umbrella review, author, year** | **Health outcome** | **Health condition** | **Systematic review/meta-analysis (SR/MA), author (year)** | **Type of physical activity** | **Dose or Intensity** | **Primary Studies (n), cases (k)** | **Effect size, (metric)** | **(95% CI)** | **eOR (95%CI)** | **Quality of included SR/MA** | **Level of evidence** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Physical health outcomes** | | | | | | | | | | | |
| Martínez-Vizcaíno et al, 2022 | Gestational Diabetes Mellitus (GDM) | Pregnancy | Pooled from MAs | Any physical activity | NR | 35 (890) | 0.61 (OR) | 0.51 - 0.74 | 0.61 (0.51-0.74) | Crtically Low to Modereate | Low |
| Martínez-Vizcaíno et al, 2022 | Gestational Hypertension (GH) | Pregnancy | Pooled from MAs | Any physical activity | NR | 21 (228) | 0.53 (OR) | 0.40 - 0.71 | 0.53 (0.40-0.71) | Crtically Low to Modereate | Low |
| Martínez-Vizcaíno et al, 2022 | Gestational Hypertension and Preeclampsia (PE) | Pregnancy | Pooled from MAs | Any physical activity | NR | 33 (511) | 0.66 (OR) | 0.54 - 0.80 | 0.66 (0.54-0.80) | Crtically Low to Modereate | Low |
| Martínez-Vizcaíno et al, 2022 | GDM: Obesity and overweight | Pregnancy | Pooled from MAs | Any physical activity | NR | 11 (298) | 0.58 (OR) | 0.43 - 0.77 | 0.58 (0.43-0.77) | Crtically Low to Modereate | Low |
| Martínez-Vizcaíno et al, 2022 | GDM: First Trimester | Pregnancy | Pooled from MAs | Any physical activity | NR | 16 (425) | 0.55 (OR) | 0.44 - 0.68 | 0.55 (0.44-0.68) | Crtically Low to Modereate | Low |
| Martínez-Vizcaíno et al, 2022 | GDM | Pregnancy | Pooled from MAs | Any physical activity | Session Duration <45 min | 11 (149) | 0.56 (OR) | 0.39 - 0.81 | 0.56 (0.39-0.81) | Crtically Low to Modereate | Low |
| Martínez-Vizcaíno et al, 2022 | GDM | Pregnancy | Pooled from MAs | Any physical activity | Session Duration >45 min | 20 (503) | 0.60 (OR) | 0.49 - 0.74 | 0.60 (0.49-0.74) | Crtically Low to Modereate | Low |
| Martínez-Vizcaíno et al, 2022 | GDM: ADA Criteria | Pregnancy | Pooled from MAs | Any physical activity | NR | 7 (137) | 0.47 (OR) | 0.29 – 0.76 | 0.47 (0.29-0.76) | Crtically Low to Modereate | Low |
| Martínez-Vizcaíno et al, 2022 | GDM: WHO Criteria | Pregnancy | Pooled from MAs | Any physical activity | NR | 6 (315) | 0.60 (OR) | 0.46 - 0.79 | 0.60 (0.46-0.79) | Crtically Low to Modereate | Low |
| Martínez-Vizcaíno et al, 2022 | GDM: Other Criteria | Pregnancy | Pooled from MAs | Any physical activity | NR | 9 (155) | 0.65 (OR) | 0.43 – 0.99 | 0.65 (0.43-0.99) | Crtically Low to Modereate | Low |
| Martínez-Vizcaíno et al, 2022 | GDM: Supervised Intervention | Pregnancy | Pooled from MAs | Any physical activity | NR | 28 (739) | 0.60 (OR) | 0.50 - 0.72 | 0.60 (0.50-0.72) | Crtically Low to Modereate | Low |
| Martínez-Vizcaíno et al, 2022 | GDM | Pregnancy | Pooled from MAs | Any physical activity | Light-Moderate Intensity | 5 (116) | 0.58 (OR) | 0.39 – 0.87 | 0.58 (0.93-0.87) | Crtically Low to Modereate | Low |
| Martínez-Vizcaíno et al, 2022 | GDM | Pregnancy | Pooled from MAs | Any physical activity | Moderate Intensity | 24 (564) | 0.56 (OR) | 0.46 – 0.68 | 0.56 (0.46-0.68) | Crtically Low to Modereate | Low |
| Martínez-Vizcaíno et al, 2022 | GH: First Trimester | Pregnancy | Pooled from MAs | Any physical activity | NR | 7 (103) | 0.46 (OR) | 0.30 – 0.69 | 0.46 (0.30-0.69) | Crtically Low to Modereate | Low |
| Martínez-Vizcaíno et al, 2022 | GH: Second Trimester | Pregnancy | Pooled from MAs | Any physical activity | NR | 9 (86) | 0.40 (OR) | 0.20 – 0.79 | 0.40 (0.20-0.79) | Crtically Low to Modereate | Low |
| Martínez-Vizcaíno et al, 2022 | GH | Pregnancy | Pooled from MAs | Any physical activity | Session Duration >45 min | 13 (170) | 0.44 (OR) | 0.31 – 0.64 | 0.44 (0.31-0.64) | Crtically Low to Modereate | Low |
| Martínez-Vizcaíno et al, 2022 | GH: Supervised Intervention | Pregnancy | Pooled from MAs | Any physical activity | NR | 18 (215) | 0.55 (OR) | 0.41 – 0.73 | 0.55 (0.41-0.73) | Crtically Low to Modereate | Low |
| Martínez-Vizcaíno et al, 2022 | GH | Pregnancy | Pooled from MAs | Any physical activity | Light-Moderate Intensity | 3 (51) | 0.44 (OR) | 0.24 – 0.80 | 0.44 (0.24-0.80) | Crtically Low to Modereate | Low |
| Martínez-Vizcaíno et al, 2022 | GH | Pregnancy | Pooled from MAs | Any physical activity | Moderate Intensity | 16 (175) | 0.58 (OR) | 0.41 – 0.81 | 0.58 (0.41-0.81) | Crtically Low to Modereate | Low |
| Martínez-Vizcaíno et al, 2022 | PE: First Trimester | Pregnancy | Pooled from MAs | Any physical activity | NR | 4 (78) | 0.34 (OR) | 0.14 - 0.87 | 0.34 (0.14-0.87) | Crtically Low to Modereate | Low |
| Shepherd-Banigan et al, 2017 | Flash severity | Peri or post-menopausal women | Pooled from MAs | Yoga | NR | 5 (545) | -0.27 (SMD) | -0.49, -0.05 | 0.61 (0.41-0.91) | Moderate | Low |
| Lesinski et al, 2020 | Muscle power (vertical jump) | Healthy youth (≤ 18 years) | Collins (2019) | Traditional resistance training | NR | 17 (NR) | 0.41 (SMD) | 0.25 – 0.56 | 2.10 (1.59-2.78) | Moderate | Low |
| Lesinski et al, 2020 | Muscle power | Healthy youth (≤ 18 years) | Behm (2017) | Traditional resistance training | NR | 39 (NR) | 0.52 (SMD) | 0.39 – 0.64 | 2.56 (2.04-3.21) | Low | Low |
| Lesinski et al, 2020 | Muscle strength | Healthy youth (≤ 18 years) | Behringer (2010) | Traditional resistance training | NR | 37 (NR) | 1.12 (SMD) | 0.90 – 1.34 | 7.59 (5.10-11.31) | Low | Very Low |
| Lesinski et al, 2020 | Muscle strength (jump) | Healthy youth (≤ 18 years) | Behringer (2011) | Any type of resistance training | NR | 34 (NR) | 0.54 (SMD) | 0.34–0.74 | 2.66 (1.85-3.82) | Low | Very Low |
| Lesinski et al, 2020 | Combined motor performance | Healthy youth (≤ 18 years) | Behringer (2011) | Any type of resistance training | NR | 34 (NR) | 0.52 (SMD) | 0.33–0.71 | 2.56 (1.82-3.62) | Low | Very Low |
| Lesinski et al, 2020 | Muscle power (squat jump) | Healthy youth (≤ 18 years) | Collins (2019) | Traditional resistance training | NR | 9 (NR) | 0.73 (SMD) | 0.97 – 1.09 | 3.75 (3.36-4.18) | Moderate | Very Low |
| Lesinski et al, 2020 | Muscle power | Healthy youth (≤ 18 years) | Behm (2017) | Plyometric training | NR | 41 (NR) | 0.69 (SMD) | 0.53 – 0.84 | 3.49 (2.63-4.62) | Low | Very Low |
| **Mental health outcomes** | | | | | | | | | | | |
| Shepherd-Banigan et al, 2017 | Psychological symptoms | Peri or post-menopausal women | Pooled from MAs | Yoga | NR | 6 (707) | -0.32 (SMD) | -0.47, -0.17 | 0.56 (0.43-0.74) | Moderate | Moderate |

Notes: CI=confidence interval, eOR=equivalent odds ratio, MA=meta-analysis, NR=not reported OR=odds ratio, SMD=standardized mean difference, SR=systematic review

# **Supplementary Table 7.** Any population and physical outcomes

| **Umbrella review, author, year** | **Health outcome** | **Health condition** | **Systematic review/meta-analysis (SR/MA), author (year)** | **Type of physical activity** | **Dose or Intensity** | **Primary Studies (n), cases (k)** | **Effect size, (metric)** | **(95% CI)** | **eOR (95%CI)** | **Quality of included SR/MA** | **Level of evidence** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Valenzuela et al, 2021 | Atrial fibrillation | Any population (unspecified) | Ayinde (2018) | Sports | NR | 8 (NR) | 1.64 (OR) | 1.10 - 2.43 | 1.64 (1.10-2.43) | Low | Convincing  (High) |
| De Rezende et al, 2017 | Breast cancer | Any population (unspecified) | Pizot (2016) | Any physical activity | NR | 38 (116304) | 0.87 (RR) | 0.84-0.90 | 0.87 (0.84-0.90) | Low | Highly Suggestive (Moderate) |
| De Rezende et al, 2017 | Colon cancer incidence or mortality | Any population (unspecified) | Wolin (2019) | Recreational physical activity | NR | 17 (10221) | 0.70 (RR) | 0.60 - 0.83 | 0.70 (0.60-0.83) | Low | Highly Suggestive (Moderate) |
| De Rezende et al, 2017 | Endometrial cancer incidence | Any population (unspecified) | Schmid (2015) | Any physical activity | NR | 33 (19558) | 0.79 (RR) | 0.74 - 0.85 | 0.79 (0.74-0.85) | Moderate | Highly Suggestive (Moderate) |
| Cillekens et al, 2020 | Colon cancer | Any population (unspecified) | Mahmood (2017) | Occupational physical activity | High intensity vs Low intensity | 15 (NR) | 0.74 (RR) | 0.67 – 0.82 | 0.74 (0.67-0.82) | Low | Moderate |
| Cillekens et al, 2020 | Rectal cancer | Any population (unspecified) | Mahmood (2017) | Occupational physical activity | High intensity vs Low intensity | 12 (NR) | 0.88 (RR) | 0.79 – 0.98 | 0.88 (0.79-0.98) | Low | Moderate |
| Cillekens et al, 2020 | Endometrial cancer (female only) | Any population (unspecified) | Schmid (2015) | Occupational physical activity | High intensity vs Low intensity | 19 (NR) | 0.81 (RR) | 0.75 – 0.87 | 0.81 (0.75-0.87) | Low | Moderate |
| Cillekens et al, 2020 | Prostate cancer (male only) | Any population (unspecified) | Liu (2011) | Occupational physical activity | High intensity vs Low intensity | 27 (NR) | 0.86 (RR) | 0.78 – 0.94 | 0.86 (0.78-0.94) | Moderate | Moderate |
| De Rezende et al, 2017 | Colon cancer incidence or mortality | Any population (unspecified) | Wolin (2019) | Any physical activity | NR | 53 (290641) | 0.75 (RR) | 0.70 - 0.80 | 0.75 (0.70-0.80) | Low | Suggestive (Moderate) |
| De Rezende et al, 2017 | Lung cancer | Any population (unspecified) | Brenner (2016) | Any physical activity | NR | 27 (21798) | 0.78 (RR) | 0.69 - 0.86 | 0.78 (0.69-0.86) | Low | Suggestive (Moderate) |
| De Rezende et al, 2017 | Lung cancer | Any population (unspecified) | Brenner (2016) | Recreational physical activity | NR | 27 (21798) | 0.78 (RR) | 0.69 - 0.86 | 0.78 (0.69-0.86) | Low | Suggestive (Moderate) |
| De Rezende et al, 2017 | Endometrial cancer | Any population (unspecified) | Schmid (2015) | Recreational physical activity | NR | 15 (7317) | 0.83 (RR) | 0.76 - 0.91 | 0.83 (0.76-0.91) | Moderate | Suggestive (Moderate) |
| De Rezende et al, 2017 | All types of cancer mortality | Any population (unspecified) | Li (2016) | Recreational physical activity | NR | 10 (21657) | 0.81 (RR) | 0.74 - 0.90 | 0.81 (0.74-0.90) | Moderate | Suggestive (Moderate) |
| De Rezende et al, 2017 | Esophageal cancer incidence or mortality | Any population (unspecified) | Behrens (2014) | Recreational physical activity | NR | 7 (1539) | 0.78 (RR) | 0.68-0.88 | 0.78 (0.68-0.88) | Moderate | Suggestive (Moderate) |
| De Rezende et al, 2017 | Breast cancer | Any population (unspecified) | Pizot (2016) | Other physical activity domains (non occupational ) | NR | 22 (32488) | 0.86 (RR) | 0.83-0.91 | 0.86 (0.83- 0.91) | Low | Suggestive (Moderate) |
| De Rezende et al, 2017 | Breast cancer | Any population (unspecified) | Pizot (2016) | Other physical activity domains (occupational and non occupational ) | NR | 13 (22106) | 0.88 (RR) | 0.82-0.93 | 0.88 (0.82-0.93) | Low | Suggestive (Moderate) |
| De Rezende et al, 2017 | Endometrial cancer | Any population (unspecified) | Schmid (2015) | Other physical activity domains | NR | 3 (1285) | 0.72 (RR) | 0.60 - 0.87 | 0.72 (0.60-0.87) | Moderate | Suggestive (Moderate) |
| De Rezende et al, 2017 | Endometrial cancer | Any population (unspecified) | Schmid (2015) | Occupational physical activity | NR | 5 (8133) | 0.82 (RR) | 0.74 - 0.92 | 0.82 (0.74-0.92) | Moderate | Suggestive (Moderate) |
| Cillekens et al, 2020 | Ischaemic stroke | Any population (unspecified) | Wendel-Vos (2004) | Occupational physical activity | High intensity vs Low intensity | 6 (NR) | 0.57 (RR) | 0.43 – 0.77 | 0.57 (0.43-0.77) | Low | Low |
| Cillekens et al, 2020 | Coronary artery disease | Any population (unspecified) | Sattelmair (2011) | Occupational physical activity | High intensity vs Low intensity | 4 (NR) | 0.84 (RR) | 0.79 – 0.90 | 0.84 (0.79-0.90) | Low | Low |
| Cillekens et al, 2020 | Proximal colon cancer | Any population (unspecified) | Robsahm (2013) | Occupational physical activity | High intensity vs Low intensity | 5 (NR) | 0.59 (RR) | 0.53 - 0.66 | 0.59 (0.53-0.66) | Low | Low |
| Cillekens et al, 2020 | Distal cancer | Any population (unspecified) | Robsahm (2013) | Occupational physical activity | High intensity vs Low intensity | 5 (NR) | 0.61 (RR) | 0.53 – 0.70 | 0.61 (0.53-0.70) | Low | Low |
| Cillekens et al, 2020 | Breast cancer (female only) | Any population (unspecified) | Pizot (2016) | Occupational physical activity | High intensity vs Low intensity | 11 (NR) | 0.88 (RR) | 0.82 – 0.95 | 0.88 (0.82-0.95) | Low | Low |
| Cillekens et al, 2020 | Gastric cancer | Any population (unspecified) | Chen (2019) | Occupational physical activity | High intensity vs Low intensity | 7 (NR) | 0.79 (RR) | 0.65 - 0.75 | 0.79 (0.65-0.75) | Moderate | Low |
| Cillekens et al, 2020 | Pancreatiac cancer | Any population (unspecified) | O'Rorke (2010) | Occupational physical activity | High intensity vs Low intensity | 4 (NR) | 0.75 (RR) | 0.59 – 0.96 | 0.75 (0.95-0.96) | Low | Very low |
| Cillekens et al, 2020 | Diabetes Melitus type II | Any population (unspecified) | Aune (2015) | Occupational physical activity | High intensity vs Low intensity | 3 (NR) | 0.85 (RR) | 0.79 – 0.92 | 0.85 (0.79-0.92) | Moderate | Very low |
| Cillekens et al, 2020 | Sleep quality | Any population (unspecified) | Yang (2018) | Occupational physical activity | High intensity vs Low intensity | 7 (NR) | 2.76 (OR) | 1.71 – 4.45 | 2.76 (1.71-4.45) | Low | Very low |
| De Rezende et al, 2017 | Gastric cancer | Any population (unspecified) | Psaltopoulou (2016) | Any physical activity | NR | 16 (10507) | 0.82 (RR) | 0.73 - 0.93 | 0.82 (0.73-0.93) | Moderate | Weak (Very low) |
| De Rezende et al, 2017 | Gastric cancer mortality | Any population (unspecified) | Psaltopoulou (2016) | Any physical activity | NR | 2 (671) | 0.68 (RR) | 0.57 - 0.82 | 0.68 (0.57-0.82) | Moderate | Weak (Very low) |
| De Rezende et al, 2017 | Pancreas cancer | Any population (unspecified) | Behrens (2015) | Any physical activity | NR | 27 (9809) | 0.88 (RR) | 0.81 - 0.95 | 0.88 (0.81-0.95) | Moderate | Weak (Very low) |
| De Rezende et al, 2017 | Kidney cancer | Any population (unspecified) | Behrens (2013) | Any physical activity | NR | 17 (10687) | 0.87 (RR) | 0.79 - 0.97 | 0.87 (0.79-0.97) | Moderate | Weak (Very low) |
| De Rezende et al, 2017 | Non-Hodgkin lymphoma, incidence or mortality | Any population (unspecified) | Jochem (2014) | Any physical activity | NR | 14 (10310) | 0.92 (RR) | 0.84-0.99 | 0.92 (0.84-0.99) | Low | Weak (Very low) |
| De Rezende et al, 2017 | Bladder cancer | Any population (unspecified) | Keimling (2014) | Any physical activity | NR | 15 27784 | 0.85 (RR) | 0.74 - 0.98 | 0.85 (0.74-0.98) | Low | Weak (Very low) |
| De Rezende et al, 2017 | Multiple sites cancer incidence or mortality | Any population (unspecified) | Shi (2015) | Any physical activity | NR | 31 (33949) | 0.86 (RR) | 0.78 - 0.96 | 0.86 (0.78-0.96) | Moderate | Weak (Very low) |
| De Rezende et al, 2017 | Glioma cancer incidence or mortality | Any population (unspecified) | Niedermaier (2015) | Any physical activity | NR | 5 (1729) | 0.85 (RR) | 0.76 - 0.96 | 0.85 (0.76-0.96) | Moderate | Weak (Very low) |
| De Rezende et al, 2017 | Meningioma incidence or mortality | Any population (unspecified) | Niedermaier (2015) | Any physical activity | NR | 4 (775) | 0.73 (RR) | 0.61 - 0.88 | 0.73 (0.61-0.88) | Moderate | Weak (Very low) |
| De Rezende et al, 2017 | Gastric cancer mortality | Any population (unspecified) | Psaltopoulou (2016) | Recreational physical activity | NR | 2 (671) | 0.68 (RR) | 0.57 - 0.82 | 0.68 (0.57-0.82) | Moderate | Weak (Very low) |
| De Rezende et al, 2017 | Meningioma, incidence or mortality | Any population (unspecified) | Niedermaier (2015) | Recreational physical activity | NR | 3 (595) | 0.72 (RR) | 0.59 - 0.87 | 0.72 (0.59-0.87) | Moderate | Weak (Very low) |
| De Rezende et al, 2017 | Hodgkin lymphoma, incidence or mortality | Any population (unspecified) | Jochem (2014) | Recreational physical activity | NR | 3 (293) | 0.66 (RR) | 0.48-0.91 | 0.66 (0.48- 0.91) | Low | Weak (Very low) |
| De Rezende et al, 2017 | Pancreas, incidence | Any population (unspecified) | Behrens (2015) | Recreational physical activity | NR | 20 (7309) | 0.89 (RR) | 0.81 - 0.98 | 0.89 (0.81-0.98) | Moderate | Weak (Very low) |
| De Rezende et al, 2017 | Glioma, incidence | Any population (unspecified) | Niedermaier (2015) | Recreational physical activity | NR | 4 (1413) | 0.85 (RR) | 0.74 - 0.99 | 0.85 (0.74-0.99) | Moderate | Weak (Very low) |
| De Rezende et al, 2017 | Bladder, incidence | Any population (unspecified) | Keimling (2014) | Recreational physical activity | NR | 10 (4681) | 0.80 (RR) | 0.64 - 0.99 | 0.80 (0.64-0.99) | Low | Weak (Very low) |
| De Rezende et al, 2017 | Colon cancer incidence or mortality | Any population (unspecified) | Wolin (2019) | Total physical activity | NR | 11 (3592) | 0.84 (RR) | 0.74-0.94 | 0.84 (0.74-0.94) | Low | Weak (Very low) |
| De Rezende et al, 2017 | Breast cancer | Any population (unspecified) | Pizot (2016) | Occupational physical activity | NR | 3 (61710) | 0.87 (RR) | 0.79 - 0.95 | 0.87 (0.79-0.95) | Critically low | Weak (Very low) |
| De Rezende et al, 2017 | Pancreas cancer | Any population (unspecified) | Behrens (2015) | Occupational physical activity | NR | 4 (1893) | 0.85 (RR) | 0.75 - 0.99 | 0.85 (0.75-0.99) | Moderate | Weak (Very low) |
| De Rezende et al, 2017 | Colon cancer, incidence or mortality | Any population (unspecified) | Wolin (2019) | Occupational physical activity | NR | 7 (235278) | 0.83 (RR) | 0.72 - 0.95 | 0.83 (0.72-0.95) | Low | Weak (Very low) |
| De Rezende et al, 2017 | Multiple sites, incidence or mortality | Any population (unspecified) | Shi (2015) | Household physical activity | NR | 11 (16969) | 0.93 (RR) | 0.87-0.99 | 0.93 (0.87-0.99) | Moderate | Weak (Very low) |
| Markozannes et al, 2016 | Prostate cancer incidence and/or mortality | Any population (unspecified) | NR | Occupational activity | NR | 13 (101304) | 0.87 (RR) | 0.80 – 0.95 | 0.87 (0.80-0.95) | NR | Weak (Very low) |

Notes: CI=confidence interval, eOR=equivalent odds ratio, MA=meta-analysis, NR=not reported OR=odds ratio, RR=risk ratio (relative risk), SR=systematic review

# **Supplementary Table 8.** Any population and mental outcomes

| **Umbrella review, author, year** | **Health outcome** | **Health condition** | **Systematic review/meta-analysis (SR/MA), author (year)** | **Type of physical activity** | **Dose or Intensity** | **Primary Studies (n), cases (k)** | **Effect size, (metric)** | **(95% CI)** | **eOR (95%CI)** | **Quality of included SR/MA** | **Level of evidence** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Bellou et al., 2015 | Parkinson disease | Any population (unspecified) | Yang (2015) | Any physical activity | High activity vs. Low activity | 5 (1348) | 0.66 (HR) | 0.57-0.78 | 0.66 (0.57-0.78) | Low | Convincing (High) |
| Zhang et al., 2023 | Cognitive decline incidence | Any population (Midlife to Late life (>45 years) | Blondell (2014) | Any physical activity | Highest vs Lowest | 21 (3735) | 0.67 (RR) | 0.57-0.78 | 0.67 (0.57-0.78) | Low | Highly Suggestive (Moderate) |
| Bellou et al., 2017 | Alzheimer’s disease | Any population (unspecified) | Beckett (2015) | Any physical activity | High activity vs. Low activity | 9 (1358) | 0.62 (HR) | 0.52-0.72 | 0.62 (0.52-0.72) | Moderate | Highly Suggestive (Moderate) |
| Zhang et al., 2023 | All-cause dementia incidence | Any population (Midlife to Late life (>45 years) | Xu (2017) | Any physical activity | Highest vs Lowest | 15 (2874) | 0.75 (RR) | 0.65-0.87 | 0.75 (0.65-0.87) | Low | Suggestive (Low) |
| Bellou et al., 2017 | Any dementia | Any population (unspecified) | Blondell (2014) | Any physical activity | High activity vs. Low activity | 21 (3845) | 0.76 (RR) | 0.66-0.86 | 0.76 (0.66-086) | Low | Suggestive (Low) |
| Zhang et al., 2023 | Alzheimer's disease incidence | Any population (Midlife to Late life (>45 years) | Xu (2017) | Any physical activity | Highest vs Lowest | 8 (1337) | 0.74 (RR) | 0.58-0.94 | 0.74 (0.58-0.94) | Low | Weak (Very low) |
| Zhang et al., 2023 | Vascular dementia incidence | Any population (Midlife to Late life (>45 years) | Aarsland (2010) | Any physical activity | Highest vs Lowest | 5 (374) | 0.64 (RR) | 0.44-0.93 | 0.64 (0.44-0.93) | Critically low | Weak (Very low) |
| Zhang et al., 2023 | All-cause dementia incidence | Any population (Midlife 45-65 years) | Kivimäki (2019) | Any physical activity | NR | 19 (2044) | 0.86 (RR) | 0.77-0.97 | 0.86 (0.77-0.97) | Critically low | Weak (Very low) |
| Zhang et al., 2023 | Alzheimer's disease incidence | Any population (Midlife 45-65 years) | Kivimäki (2019) | Any physical activity | NR | 13 (1520) | 0.85 (RR) | 0.74-0.98 | 0.85 (0.74-0.98) | Critically low | Weak (Very low) |

Notes: CI=confidence interval, eOR=equivalent odds ratio, HR=hazard ratio, MA=meta-analysis, NR=not reported OR=odds ratio, RR=risk ratio (relative risk), SR=systematic review

# **Supplementary Table 9.** Results from sensitivity analysis including only prospective studies.

| **Umbrella review, author, year** | **Health outcome** | **Health condition** | **Systematic review/meta-analysis (SR/MA), author (year)** | **Type of physical activity** | **Dose or Intensity** | **Primary Studies (n), cases (k)** | **Effect size, (metric)** | **(95% CI)** | **eOR (95%CI)** | **Level of evidence** | **Level of evidence in prospective studies** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Zhang et al., 2023 | All-cause dementia incidence | Any population (Midlife to Late life (>45 years) | Xu (2017) | Any physical activity | Highest vs Lowest | 15 (2874) | 0.75 (RR) | 0.65-0.87 | 0.75 (0.65-0.87) | Suggestive | Suggestive (0.75, RR; 0.65-0.87) |
| Zhang et al., 2023 | Alzheimer's disease incidence | Any population (Midlife to Late life (>45 years) | Xu (2017) | Any physical activity | Highest vs Lowest | 8 (1337) | 0.74 (RR) | 0.58-0.94 | 0.74 (0.58-0.94) | Weak | Weak (0.74, RR;0.58-0.94) |
| Zhang et al., 2023 | Vascular dementia incidence | Any population (Midlife to Late life (>45 years) | Aarsland (2010) | Any physical activity | Highest vs Lowest | 5 (374) | 0.64 (RR) | 0.44-0.93 | 0.64 (0.44-0.93) | Weak | Weak (0.64, RR; 0.44-0.93) |
| Zhang et al., 2023 | Cognitive decline incidence | Any population (Midlife to Late life (>45 years) | Blondell (2014) | Any physical activity | Highest vs Lowest | 21 (3735) | 0.67 (RR) | 0.57-0.78 | 0.67 (0.57-0.78) | Highly Suggestive | Highly Suggestive (0.67, RR;0.57-0.78) |
| Zhang et al., 2023 | All-cause dementia incidence | Any population (Midlife 45-65 years) | Kivimäki (2019) | Any physical activity | NR | 19 (2044) | 0.86 (RR) | 0.77-0.97 | 0.86 (0.77-0.97) | Weak | Weak (0.86, RR; 0.77-0.97) |
| Zhang et al., 2023 | Alzheimer's disease incidence | Any population (Midlife 45-65 years) | Kivimäki (2019) | Any physical activity | NR | 13 (1520) | 0.85 (RR) | 0.74-0.98 | 0.85 (0.74-0.98) | Weak | Weak (0.85, RR; 0.74-0.98) |
| Trott et al., 2022 | Diabetic retinopathy | Type II diabetes melitus | Ren (2019) | Total physical activity | Moderate | 15 (NR) | 0.95 (RR) | 0.91–0.99 | 0.95 (0.91-0.99) | Suggestive | Non significant (0.98, RR; 0.68-1.42) |
| De Rezende et al, 2017 | Endometrial cancer incidence | Any population (unspecified) | Schmid (2015) | Any physical activity | NR | 33 (19558) | 0.79 (RR) | 0.74 - 0.85 | 0.79 (0.74-0.85) | Highly suggestive | Suggestive (0.83, RR;0.76, 0.92) |
| De Rezende et al, 2017 | All types of cancer mortality | Cancer | Li (2016) | Any physical activity | NR | 25 (40469) | 0.79 (RR) | 0.75 - 0.85 | 0.79 (0.75-0.85) | Highly Suggestive | Highly Suggestive (0.79, RR; 0.75, 0.85) |
| De Rezende et al, 2017 | Breast cancer | Any population (unspecified) | Pizot (2016) | Any physical activity | NR | 38 (116304) | 0.87 (RR) | 0.84-0.90 | 0.87 (0.84-0.90) | Highly Suggestive | Highly Suggestive (0.87, RR; 0.84-0.90) |
| De Rezende et al, 2017 | Colon cancer incidence or mortality | Any population (unspecified) | Wolin (2019) | Any physical activity | NR | 53 (290641) | 0.75 (RR) | 0.70 - 0.80 | 0.75 (0.70-0.80) | Suggestive | Suggestive (0.81 RR, 0.75 -0.88) |
| De Rezende et al, 2017 | Lung cancer | Any population (unspecified) | Brenner (2016) | Any physical activity | NR | 27 (21798) | 0.78 (RR) | 0.69 - 0.86 | 0.78 (0.69-0.86) | Suggestive | Suggestive (0.79, RR;0.70-0.90) |
| De Rezende et al, 2017 | Pancreas cancer | Any population (unspecified) | Behrens (2015) | Any physical activity | NR | 27 (9809) | 0.88 (RR) | 0.81 - 0.95 | 0.88 (0.81-0.95) | Weak | Weak (0.93, RR;0.87, 0.99) |
| De Rezende et al, 2017 | Multiple sites cancer incidence or mortality | Any population (unspecified) | Shi (2015) | Any physical activity | NR | 31 (33949) | 0.86 (RR) | 0.78 - 0.96 | 0.86 (0.78-0.96) | Weak | Weak (0.93, RR;0.87, 0.99) |
| De Rezende et al, 2017 | Meningioma incidence or mortality | Any population (unspecified) | Niedermaier (2015) | Any physical activity | NR | 4 (775) | 0.73 (RR) | 0.61 - 0.88 | 0.73 (0.61-0.88) | Weak | Weak (0.71, RR; 0.58, 0.88) |
| De Rezende et al, 2017 | Colon cancer incidence or mortality | Any population (unspecified) | Wolin (2019) | Recreational physical activity | NR | 17 (10221) | 0.70 (RR) | 0.60 - 0.83 | 0.70 (0.60-0.83) | Highly suggestive | Convincing (0.79 RR, 0.71-0.76) |
| De Rezende et al, 2017 | Lung cancer | Any population (unspecified) | Brenner (2016) | Recreational physical activity | NR | 27 (21798) | 0.78 (RR) | 0.69 - 0.86 | 0.78 (0.69-0.86) | Suggestive | Suggestive 0.79 (0.70-0.90) |
| De Rezende et al, 2017 | All types of cancer mortality | Any population (unspecified) | Li (2016) | Recreational physical activity | NR | 10 (21657) | 0.81 (RR) | 0.74 - 0.90 | 0.81 (0.74-0.90) | Suggestive | Suggestive (0.81 RR, 0.74- 0.90) |
| De Rezende et al, 2017 | Esophageal cancer incidence or mortality | Any population (unspecified) | Behrens (2014) | Recreational physical activity | NR | 7 (1539) | 0.78 (RR) | 0.68-0.88 | 0.78 (0.68-0.88) | Suggestive | Weak (0.83, RR; 0.69-0.99) |
| De Rezende et al, 2017 | Meningioma, incidence or mortality | Any population (unspecified) | Niedermaier (2015) | Recreational physical activity | NR | 3 (595) | 0.72 (RR) | 0.59 - 0.87 | 0.72 (0.59-0.87) | Weak | Weak (0.69 RR,0.55- 0.88) |
| De Rezende et al, 2017 | Colon cancer incidence or mortality | Any population (unspecified) | Wolin (2019) | Total physical activity | NR | 11 (3592) | 0.84 (RR) | 0.74-0.94 | 0.84 (0.74-0.94) | Weak | Weak (0.84, RR;0.74-0.94) |
| De Rezende et al, 2017 | Endometrial cancer | Any population (unspecified) | Schmid (2015) | Occupational physical activity | NR | 5 (8133) | 0.82 (RR) | 0.74 - 0.92 | 0.82 (0.74-0.92) | Suggestive | Suggestive (0.82, RR;0.74-0.92) |
| De Rezende et al, 2017 | Breast cancer | Any population (unspecified) | Pizot (2016) | Occupational physical activity | NR | 3 (61710) | 0.87 (RR) | 0.79 - 0.95 | 0.87 (0.79-0.95) | Weak | Weak ( 0.87, RR; 0.79-0.95) |
| De Rezende et al, 2017 | Pancreas cancer | Any population (unspecified) | Behrens (2015) | Occupational physical activity | NR | 4 (1893) | 0.85 (RR) | 0.75 - 0.99 | 0.85 (0.75-0.99) | Weak | Weak (0.85, RR;0.75-0.99) |
| De Rezende et al, 2017 | Colon cancer, incidence or mortality | Any population (unspecified) | Wolin (2019) | Occupational physical activity | NR | 7 (235278) | 0.83 (RR) | 0.72 - 0.95 | 0.83 (0.72-0.95) | Weak | Weak (0.83, RR; 0.72- 0.95) |
| De Rezende et al, 2017 | All types of cancer mortality | Cancer | Li (2016) | Other physical activity domains | NR | 13 (16408) | 0.75 (RR) | 0.68 - 0.83 | 0.75 (0.68-0.83) | Highly Suggestive | Highly Suggestive (0.75, RR; 0.68, 0.83) |
| De Rezende et al, 2017 | Breast cancer | Any population (unspecified) | Pizot (2016) | Other physical activity domains (non occupational ) | NR | 22 (32488) | 0.86 (RR) | 0.83-0.91 | 0.86 (0.83- 0.91) | Suggestive | Suggestive (0.86, RR;0.83-0.91) |
| De Rezende et al, 2017 | Breast cancer | Any population (unspecified) | Pizot (2016) | Other physical activity domains (occupational and non occupational ) | NR | 13 (22106) | 0.88 (RR) | 0.82-0.93 | 0.88 (0.82-0.93) | Suggestive | Suggestive (0.88, RR;0.82-0.93) |
| De Rezende et al, 2017 | Endometrial cancer | Any female non- endometrial cancer patient | Schmid (2015) | Other physical activity domains | NR | 3 (1285) | 0.72 (RR) | 0.60 - 0.87 | 0.72 (0.60-0.87) | Suggestive | Suggestive (0.72, RR; 0.60-0.87) |
| De Rezende et al, 2017 | Multiple sites, incidence or mortality | Any population (unspecified) | Shi (2015) | Household physical activity | NR | 11 (16969) | 0.93 (RR) | 0.87-0.99 | 0.93 (0.87-0.99) | Weak | Weak (0.93, RR; 0.87- 0.99) |
| Bellou et al., 2017 | Alzheimer’s disease | Any population (unspecified) | Beckett (2015) | Any physical activity | High activity vs. Low activity | 9 (1358) | 0.62 (HR) | 0.52-0.72 | 0.62 (0.52-0.72) | Highly Suggestive | Highly Suggestive (062, RR; 95%CI 0.52-0.72) |

Notes: CI=confidence interval, eOR=equivalent odds ratio, HR=hazard ratio, MA=meta-analysis, NR=not reported, RR=risk ratio (relative risk), SR=systematic review