



Artificial Intelligence in Construction Delay Analysis and Management: A Review

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Received: May 22, 2026

Revised: July 28, 2026

Accepted: August 24, 2026

Published: October 13, 2026

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Cite as: Ismail S, Ramli N, Razi P, Jaya R, Yusrizal U. Artificial Intelligence in Construction Delay Analysis and Management: A Review. Open Constr Build Technol J, 2026; 20: e18748368514653. <http://dx.doi.org/10.2174/0118748368514653261006200640>



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Table S1. Geographical and project-context characteristics of the included studies.

Reference	Country/Region	Project Type	Project Orientation	Physical Setting	Project Complexity	Main Material/Construction System
[1]	Middle East and North Africa (MENA) region; Egypt used as the case study	Construction projects involving cost-overrun risk assessment across multiple project types	Mixed / not project-specific	Predominantly land-based; specific physical settings not reported	Mixed; multi-stakeholder and multi-risk construction context	Not reported
[2]	Kuwait	Government building projects	Vertical/building construction	Above-ground; land-based	Conventional building projects; specific complexity not reported	Not reported
[3]	Makkah region, Kingdom of Saudi Arabia	Public building and transportation construction projects	Mixed vertical/building and horizontal/transportation construction	Above-ground; land-based	Mixed; projects varied by type, size and managing department	Mixed public-construction systems; specific materials not reported
[9]	Global literature	AI applications for air-pollution forecasting, construction-material performance, worker health and safety, and cyber-physical systems	Mixed / cross-domain	Mixed / not project-specific	Not applicable; review-level evidence	Mixed construction-material applications; no single primary material
[10]	Nigeria	Construction projects selected from respondents' past experience; type not specified	Not reported / mixed	Not reported	Not reported / mixed	Not reported

(Table S1) contd.....

Reference	Country/Region	Project Type	Project Orientation	Physical Setting	Project Complexity	Main Material/Construction System
[15]	Global literature	AI applications across multiple construction activities, including activity monitoring, risk management, resource optimisation and waste management	Mixed / cross-domain	Mixed / not project-specific	Not applicable; review-level evidence	Mixed / no single primary material
[16]	Global literature and construction-industry perspectives	Potential Generative AI applications across the construction and AEC sectors	Mixed / conceptual	Mixed / not project-specific	Not applicable; conceptual/review evidence	Not applicable / no single primary material
[21]	Japan	Five New Austrian Tunnelling Method road-tunnel projects	Horizontal/linear infrastructure	Underground; land-based	Complex/specialised	Rock/ground and NATM tunnel-support system
[22]	United Arab Emirates (Dubai)	Residential/villa complex; brickwork activity	Vertical/building construction	Above-ground; land-based	Conventional/lower-complexity	Brick/masonry
[23]	Jordan	Completed engineering projects, including buildings, roads, tunnels, stadium-repair projects and other project types	Mixed vertical, horizontal and underground infrastructure	Land-based; mixed above-ground and underground works	Mixed	Mixed project materials; not consistently reported
[26]	India; specific project locations were not reported	Various completed and incomplete construction projects; individual project categories were not reported	Mixed / not specifically reported	Land-based construction is implied	Not reported / mixed	Not reported
[27]	Jordan	Building construction projects	Vertical/building construction	Above-ground; land-based	Conventional/lower-complexity	Not reported
[28]	Saudi Arabia	General construction projects; specific project categories not reported	Not reported / mixed	Not reported; land-based construction is implied	Not reported / mixed	Not reported
[29]	Country of individual projects not explicitly reported; database maintained by a Chilean LPS IT-support system	High-rise buildings and industrial construction	Vertical and industrial; mixed	Above-ground; land-based	Mixed	Mixed high-rise and industrial systems; materials not reported
[30]	Egypt, Qatar, Kuwait, Saudi Arabia, United Arab Emirates and Oman	Marine construction projects from public and private sectors	Mixed coastal, offshore and marine infrastructure	Predominantly water-based/coastal; may include onshore marine facilities	Complex/specialised	Marine/coastal construction systems; materials not reported
[32]	South Asia: Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka	Energy, roadway/highway, rural/urban development, railway, port and bridge infrastructure	Predominantly horizontal/linear and heavy infrastructure; mixed	Mostly land-based; port projects are water-related	Complex/specialised	Mixed infrastructure materials; not consistently reported
[40]	Jordan	Building projects	Vertical/building construction	Above-ground; land-based	Conventional/lower-complexity	Not reported
[41]	Lagos Island, Lagos State, Nigeria	Building and construction industry practices rather than one specific construction project	Mixed / industry-wide	Predominantly land-based building and construction activities	Not applicable; industry-wide survey	Not reported
[42]	Hong Kong	Interior construction and decoration of hotel rooms	Vertical/building interior construction	Above-ground interior; land-based	Conventional/lower-complexity	Interior finishing and decoration materials; specific types not reported

(Table S1) contd.....

Reference	Country/Region	Project Type	Project Orientation	Physical Setting	Project Complexity	Main Material/Construction System
[43]	Taiwan	Public national-university school buildings, including teaching and administrative buildings	Vertical/building construction	Above-ground; land-based	Conventional/lower-complexity	Not reported
[44]	Hong Kong	Public rental-housing project; rebar-fixing during structural framing on typical floors 14-33	Vertical/high-rise building construction	Above-ground; land-based	Complex/specialised project; conventional repetitive activity	Steel reinforcement within reinforced-concrete framing
[45]	United Kingdom	Infrastructure/heavy construction: rail, highways, water, power, airports, marine and underground works	Predominantly horizontal/linear; mixed above- and underground	Land-based, underground and water-related projects	Complex/specialised	Mixed infrastructure systems; materials not consistently reported
[46]	Serbia	A 65 km highway comprising two sections, with route, bridge and tunnel entities	Horizontal/linear road infrastructure with bridge and tunnel structures	Land-based; mixed above-ground and underground works	Complex/specialised	Mixed highway, bridge and tunnel systems; materials not consistently reported
[47]	Serbia	European Road Corridor 10 highway projects, including road sections, parallel local roads, bridges and seven tunnels	Predominantly horizontal/linear infrastructure; includes bridge and tunnel works	Land-based; mixed above-ground and underground works	Complex/specialised	Mixed road, bridge and tunnel systems; materials not consistently reported
[49]	East Java, Indonesia	Trans-South Java Road Development Project between Tulungagung, Serang and Malang	Horizontal/linear road infrastructure	Above-ground; land-based, with rugged terrain and extensive rock and soil excavation	Complex/specialised	Rock and soil excavation; road materials not reported
[50]	Project location not disclosed; research conducted with a specialist construction-claims/FDA organisation	Contemporary multi-building project used for a forensic-delay case simulation, including a data-centre building	Building construction / multi-building development	Above-ground; land-based	Complex/specialised	Not reported
[51]	Iran and Iraq; location of the additional test tunnel was not explicitly reported	Road-tunnel construction projects	Horizontal/linear infrastructure	Underground; land-based	Complex/specialised	Rock/ground and conventional road-tunnel excavation and support systems
[52]	Project country was not explicitly reported	Five publicly funded construction projects comprising buildings, roads and municipal infrastructure	Mixed vertical/building and horizontal/infrastructure construction	Predominantly above-ground and land-based; specific settings were not reported	Mid-scale projects with mixed complexity; contracted values ranged from EUR 15 million to EUR 25 million	Mixed construction systems; principal materials were not reported
[53]	Global literature	Whole-building lifecycle applications covering architectural design, materials, structural analysis, offsite manufacturing, construction management, progress monitoring, safety, building operation and circular economy	Mixed / cross-lifecycle	Mixed / not project-specific	Not applicable; review-level evidence	Mixed materials and systems, including concrete, steel and timber applications
[54]	Project locations were not explicitly reported	Five dam-construction projects	Major water-infrastructure construction	Land- and water-related construction settings	Complex/specialised	Dam-construction systems; principal materials were not reported

(Table S1) contd.....

Reference	Country/Region	Project Type	Project Orientation	Physical Setting	Project Complexity	Main Material/Construction System
[58]	Global literature	Preconstruction-stage duration estimation across general construction project-delivery systems	Mixed	Mixed / not project-specific	Not applicable; review-level evidence	Not applicable / mixed project contexts
[59]	Hong Kong	198 green building projects	Vertical/building construction	Above-ground; land-based	Mixed building projects; specific complexity not reported	Not reported
[60]	Country and project location were not explicitly reported	Ongoing construction project analysed at the work-area level	Not specifically reported	Active land-based construction site; specific setting not reported	Not reported	Not reported
[61]	Cold regions of India, including Ladakh, Himachal Pradesh and Uttarakhand	Construction projects affected by extreme cold-weather conditions; specific project categories were not separately reported	Mixed / not project-specific	Land-based, high-altitude and cold-climate environments	Complex/specialised due to snowfall, freezing temperatures and weather-related logistical constraints	Not reported
[62]	Ethiopia	Construction projects; project categories not specified	Not reported / mixed	Not reported	Not reported / mixed	Not reported
[63]	Not applicable; synthetic/hypothetical BIM use-case	Generic BIM-based building project for design-change analysis	Vertical/building construction	Above-ground; land-based	Not reported / not applicable	Not reported; synthetic BIM use-case
[68]	Project location not reported; authors based in Egypt	Indoor bricklaying activity in building construction	Vertical/building construction	Above-ground indoor environment; land-based	Conventional repetitive construction activity	Brick/masonry
[70]	Florida, United States	Highway projects across federal, interstate, state, county, rural, district and village road systems	Horizontal/linear infrastructure	Above-ground; land-based	Complex/specialised	Highway/pavement materials not reported
[72]	India	Mixed construction projects, including housing, power plants, roads, industrial and multistorey buildings, utility networks, railways, bridges and water-resource projects	Mixed vertical, horizontal and infrastructure projects	Predominantly land-based; mixed physical settings	Mixed	Mixed construction materials; not consistently reported
[73]	Baghdad, Iraq	Public-sector construction projects from AL-ZAWRAA State Company covering various engineering specialties	Mixed construction projects	Predominantly land-based; specific settings were not reported	Mixed	Not reported
[74]	India	Mixed infrastructure and building projects, including an elevated metro station, residential high-rise development and bridge construction	Mixed vertical/building and horizontal/infrastructure construction	Above-ground; land-based urban, semi-urban and rural settings	Mixed; projects varied in scale, complexity, regulatory exposure and environmental risk	Mixed construction systems; principal materials were not reported
[76]	Global literature	Artificial intelligence in construction project management across initiation, planning, execution, monitoring and control, and handover	Mixed / cross-lifecycle	Mixed / not project-specific	Not applicable; review-level evidence	Mixed / no single primary material

Table S2. Implementation, deployment and continued-use characteristics of the included studies.

Reference	Year	Data Period	Implementation Stage	Deployment Duration and Continued-Use Status	Users
[1]	2025	Literature published from 2000 to 2024; 405 records were reviewed and 64 studies retained. The empirical survey produced 369 valid responses; the survey calendar period was not reported	Survey-based analytical model development using K-means clustering and fuzzy group decision-making	No operational deployment duration reported; the literature and survey periods represent source-data collection rather than system use	Actual respondents included clients, contractors and consultants; intended users include construction professionals, project managers and risk-management decision-makers
[2]	2025	Pilot questionnaire involving 60 construction professionals; the calendar data-collection period was not reported	Pilot survey and confirmatory factor analysis model validation	No operational deployment duration reported; the study validated the questionnaire for subsequent full-scale research	Actual respondents comprised project-management consultants, contractors and consultants; intended users include policymakers, project managers and public-sector construction stakeholders
[3]	2025	Records from 32 completed public construction projects undertaken between 2010 and 2019	Retrospective project-record analysis and statistical model evaluation	No operational deployment duration reported; 2010–2019 represents the underlying project-data period	Intended users include public-sector project owners, project managers, engineers, contractors and change-order decision-makers
[9]	2024	Literature collected from PubMed, Scopus, Web of Science, MedRxiv, arXiv, Google Scholar and SciSpace; the exact search dates were not reported	Review / non-application evidence	Not applicable	Intended users: researchers, construction-industry stakeholders, safety professionals, environmental analysts and material specialists
[10]	2021	Questionnaire-based retrospective data; respondents recalled projects previously worked on	Survey-based model development and validation	No deployment duration reported	Intended users: construction-sector stakeholders; future integration into construction information systems proposed
[15]	2021	Literature on AI applications and publication trends in the construction industry available up to 2021; exact search dates and study-selection period were not reported	Critical literature review / non-application evidence	Not applicable	Intended users include construction researchers, practitioners, project managers, organisations and industry decision-makers
[16]	2023	Non-systematic review and LinkedIn industry perspectives collected over the three months leading to 20 August 2023	Non-systematic review and conceptual implementation framework / non-application evidence	Not applicable; deployment in the proposed framework is conceptual	Intended users: construction companies, AEC professionals, researchers, technology providers and policymakers
[21]	2025	Design and construction records; calendar years of the five projects not reported	Retrospective model development and validation	No deployment duration reported	Intended users: tunnel and mining engineers, planners and risk managers
[22]	2023	Active-site productivity records; September 2017; three-week monitoring period	Live-project pilot / case-study validation	3 weeks: first 2 weeks for training and week 3 for validation; continued use after the pilot was not reported	Actual site data recorded by supervisors; intended users include construction managers and planning engineers
[23]	2025	Historical records for projects completed between 2005 and 2021, obtained from Amman Municipality, the Ministry of Construction and Housing, private companies and engineering offices	Retrospective historical-data model development and validation	No operational deployment duration reported	Intended users: construction managers, planners, public authorities and engineering decision-makers
[26]	2025	Questionnaire-based project data; the survey and project calendar periods were not reported	Survey-based model development and hold-out validation using interpolation-augmented data	No operational deployment duration; integration with real-time project tracking was identified as future work	Intended users: project managers, clients, contractors and consultants
[27]	2024	Completed-project records from 2008 to 2022, primarily from the Ministry of Public Works and Housing with additional contractor data	Retrospective model development and validation	No operational deployment duration reported	Intended users: construction project managers and Jordanian construction-sector decision-makers
[28]	2025	Historical company records compiled over a seven-month research data-collection period	Retrospective model development and validation	No deployment duration; seven months refers to research data collection, not system use	Intended users: project managers, contractors and decision-makers
[29]	2024	Database contained projects carried out from 2010 to 2021	Retrospective model development and validation	No live deployment duration reported	Intended users: project managers and Last Planner System practitioners

(Table S2) contd....

Reference	Year	Data Period	Implementation Stage	Deployment Duration and Continued-Use Status	Users
[30]	2024	Questionnaire and project case data; literature search covered 1985-2023; calendar period of the 30 projects was not reported	Survey- and case-data-based model development and validation	No deployment duration; the recommendation to update the model continuously with real-time data describes future practice	Intended users: marine construction project-management engineers and decision-makers
[32]	2025	Completed-project reports; projects completed from 1989 to 2017	Retrospective analytical modelling	No deployment or pilot duration reported	Intended users: governments, developers, banks, project managers, consultants and infrastructure users
[40]	2023	Completed-project database; completion dates from 2008 to 2021	Retrospective model development and validation	No deployment duration reported	Intended users: construction stakeholders, including owners, contractors, consultants and project managers
[41]	2022	Questionnaire survey conducted from January to March 2021	Industry adoption and current-use survey evidence	Current use was captured only at the January-March 2021 survey point; application duration was not measured and post-survey continued use was not reported	Actual users/respondents: Nigerian construction professionals in consulting firms, contracting firms, client organisations and government agencies; intended users include industry bodies and policymakers
[42]	2023	On-site panoramic-image collection during interior construction; calendar dates were not reported	Functional computer-vision prototype with real-site case-study validation	Each image required no more than approximately 3 seconds to capture and each assessment used one or two images; no sustained deployment period reported	Intended users: construction progress-monitoring personnel, project managers and site teams
[43]	2022	Completed public-school building projects collected from 2009 to 2019	Retrospective model development and validation	No deployment duration reported	Intended users: government departments, owners, project managers, and design and construction firms
[44]	2025	Active-site observations originally collected over six months; the present paper reuses the previously published dataset	Retrospective model development using an active-site observational dataset	Six months describes the original field-observation period, not deployment of the developed ML framework	Intended users: construction managers, planners and workforce/resource-allocation decision-makers
[45]	2022	Completed projects constructed from 2007 to 2019	Retrospective model development and case-study validation	No operational deployment duration reported	Intended users: planners and schedule-risk analysts
[46]	2022	Weekly Minutes of Meetings from January 2018 to February 2020; the road was open to traffic when data were collected and the project recorded a 42% delay	Functional research prototype with retrospective single-project case validation using actual project documentation	No operational deployment duration; January 2018-February 2020 is the MoM source-data period and the reported experiments used cross-validation	Intended users: project managers, delay analysts, construction experts and project stakeholders
[47]	2024	28 completed contracts/projects: eastern branch constructed from 2009 to 2024 and southern branch from 2010 to 2024	Retrospective model development and completed-project testing	No operational deployment duration; 2009/2010-2024 is the underlying project period and two days refers to the expert interview	Intended users: project managers, infrastructure risk managers and other road-project decision-makers
[49]	2024	One project with a planned duration of 131 weeks; weeks 1-110 were used as generator/training data and weeks 111-121 as the prediction period	Real-project case-study validation using project progress records	An 11-week forecast window was evaluated; no evidence that the model operated continuously during construction	Intended users: project teams and managers responsible for scheduling and progress control
[50]	2025	Observation of FDA practice at intervals over three years; archival data from past projects; contemporary project data used in the prototype	Functional prototype / case-based simulation with expert evaluation	No operational deployment period reported; expert interviews lasted approximately one to two hours	Actual evaluators/users: forensic delay-analysis experts; intended users include delay analysts and project participants
[51]	2022	A training dataset comprising 350 data points from 34 historical tunnels, including 25 tunnels in Iran and nine in Iraq, together with 181 test data points from one additional tunnel; calendar years were not reported	Retrospective machine-learning model development and validation using LR, GPR, SVR and DT models, with GWO-based hyperparameter optimisation and five-fold cross-validation	No operational deployment duration reported; the models were trained and tested retrospectively using historical tunnel data	Intended users include tunnelling engineers, planners, designers, cost estimators, project managers and early-stage decision-makers

(Table S2) contd.....

Reference	Year	Data Period	Implementation Stage	Deployment Duration and Continued-Use Status	Users
[52]	2025	Data from five completed publicly funded projects contracted from 2016 onward; each project was assessed at three stages of execution using project documentation and stakeholder interviews	Retrospective neural-network model development and testing using completed-project data; 182 model experiments were conducted with a 70/30 train-test split	No operational deployment duration reported; the models were developed and evaluated experimentally using completed-project data	Actual data contributors included representatives of clients, consultants and contractors; intended users include project managers and other key project stakeholders
[53]	2022	State-of-the-art literature available up to the article's 2021-2022 preparation period; no single formal search date or final included-study count was reported	State-of-the-art review / non-application evidence	Not applicable	Intended users: researchers, architects, engineers, contractors, manufacturers and facility managers
[54]	2022	A total of 398 data points obtained from five dam projects; the project calendar periods were not reported	Retrospective hybrid machine-learning model development and validation using MLP-GA, MLP-PSO and Kalman-filter approaches	No operational deployment duration reported; the models were developed and evaluated using historical project-performance data	Intended users include project managers, planners, cost controllers and schedule-performance decision-makers
[58]	2024	Review of prior studies and empirical examples from construction and other domains; no new construction-project dataset	Topical review and conceptual-model proposal / non-application evidence	Not applicable	Intended users: construction researchers, estimators, planners and project managers
[59]	2023	Completed projects implemented from 2002 to 2019	Retrospective model development and validation	No deployment duration reported	Intended users: project managers, project stakeholders and government institutions
[60]	2024	Field data from an ongoing construction project, including progress, workload, labour, weather, planned duration and work-area location; calendar dates and collection duration were not reported	Real-project data-based comparative machine-learning model development and validation using KNN, SVR, GBT and ANN	No operational deployment duration reported; the models were trained and evaluated using field data from the ongoing project	Intended users include project managers, planners, contractors and construction schedule-control personnel
[61]	2025	Survey responses from 83 construction experts working in India's cold regions; the survey calendar period was not reported	Survey-based model development and validation using exploratory factor analysis, structural equation modelling and artificial neural networks	No operational deployment duration reported; the ANN was developed and tested using questionnaire data	Actual respondents included construction professionals with experience in cold regions; intended users include contractors, subcontractors, project managers and construction planners
[62]	2021	Field and government-office records from completed projects; contractual durations ranged from 1 to 4 years	Retrospective model development and sensitivity validation	No application deployment duration reported	Intended users: construction managers and foreign general contractors operating in Ethiopia
[63]	2023	Synthetic dataset generated within a BIM model; no real-project data-collection period	Synthetic proof-of-concept / conceptual model validation	No deployment duration reported	Intended users: design managers, clients, contractors, construction managers and other project stakeholders
[68]	2025	A dataset of 531 brick images obtained from real-world construction sites and internet-based datasets; after data augmentation, 1275 images were used for model development. The image-collection dates were not reported	Functional computer-vision and digital-twin prototype developed using YOLOv8, BIM integration and dataset-based model validation	No sustained real-project deployment duration reported; the model was trained, validated and tested using the compiled image dataset	Intended users include project managers, construction managers, planning engineers and site progress-monitoring personnel
[70]	2022	Florida DOT project data from 2006 to 2021; data transformation/preparation took approximately 10 months	Retrospective model development and validation	No deployment duration; 2006-2021 is the project-data period and 10 months is data preparation	Intended users: contract parties, decision-makers, administrators and policy-makers
[72]	2024	Surveyed project experience related to projects built from 2015 to 2019	Pilot-survey-based model development and validation	No operational deployment duration reported	Survey participants and intended users include contractors, owners, consultants, field engineers, suppliers, project managers and surveyors
[73]	2021	Project records covering projects established from 2010 to 2020	Retrospective historical-project model development and validation	No operational deployment duration reported	Intended users: project managers, contractors and public-sector construction authorities

(Table S2) contd.....

Reference	Year	Data Period	Implementation Stage	Deployment Duration and Continued-Use Status	Users
[74]	2025	Dataset comprising 150 Indian construction-project records obtained from government databases, private-sector project reports, project-management software and monitoring sources; three completed projects were additionally used for case-study validation. The calendar data period was not reported	Retrospective comparative machine-learning model development and validation using MLR, SVR, ANN, RFR and GBM, classified through a black-grey-white-box interpretability framework	No routine operational deployment duration reported; models were trained using an 80:20 train-test split and validated using completed-project case studies	Intended users include site engineers, project planners, project managers, contractors and schedule-risk decision-makers
[76]	2025	Peer-reviewed articles published from 1985 to 2024 and retrieved from Scopus, Web of Science and ProQuest	Structured literature review / non-application evidence	Not applicable	Intended users: researchers, construction practitioners and policymakers

PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Page 1
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Page 1
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Introduction, Paragraphs 1-6 (Pages 2-3)
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Introduction last paragraph (Page 2); Abstract Objective (Page 1)
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Section 2.4 Screening; Section 2.5 Eligibility Assessment (Pages 3-4)
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.	Section 2.3 Identification (Pages 2-3)
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Table 1 Search Strings (Page 3)
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.	Section 2.4 Screening; Fig. 1 PRISMA Flow Diagram (Page 3)
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.	Section 2.6 Included Studies (Page 4)
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 (<i>e.g.</i> for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Section 2.6 Included Studies (Page 4)
	10b	List and define all other variables for which data were sought (<i>e.g.</i> participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Section 2.6 Included Studies (Page 4)
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.	Not reported

Table contd.....

Section and Topic	Item #	Checklist item	Location where item is reported
Effect measures	12	Specify for each outcome the effect measure(s) (<i>e.g.</i> risk ratio, mean difference) used in the synthesis or presentation of results.	Not applicable (qualitative synthesis only)
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (<i>e.g.</i> tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Section 3.2 Thematic Classification (Pages 4-6)
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Not reported
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Table 1; Fig. 1; Sections 3.2-3.3 (Pages 3-6)
	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.	Section 2.6 Included Studies; Section 3 Results (Pages 4-6)
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (<i>e.g.</i> subgroup analysis, meta-regression).	Not applicable
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	Not applicable
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	Not reported
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Not reported
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.	Fig. 1 PRISMA Flow Diagram; Section 2.6 (Pages 3-4)
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Fig. 1 PRISMA Flow Diagram (Page 3)
Study characteristics	17	Cite each included study and present its characteristics.	Section 3 Results (Pages 4-6)
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Not reported
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 (<i>e.g.</i> confidence/credible interval), ideally using structured tables or plots.	Section 3.2.1 - 3.2.4 (Pages 5-6)
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Section 3.3 Summary of Findings (Page 6)
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (<i>e.g.</i> confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	Not applicable
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	Not applicable
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	Not applicable
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Not reported
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	Not reported
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Discussion Section 4 (Pages 6-8)
	23b	Discuss any limitations of the evidence included in the review.	Section 4.2 (Pages 7-8)
	23c	Discuss any limitations of the review processes used.	Section 4.2 (Pages 7-8)
	23d	Discuss implications of the results for practice, policy, and future research.	Section 4.3 Future Research Directions (Page 7); Conclusion (Page 8)

Table contd.....

Section and Topic	Item #	Checklist item	Location where item is reported
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.	Not reported
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Not reported
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	Not applicable
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Competing interests	26	Declare any competing interests of review authors.	Conflict of Interest (Page 8)
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.	Availability of Data and Materials (Page 8)

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, *et al.* The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71. doi: 10.1136/bmj.n71
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