PRISMA 2020 Checklist

Manuscript sustainability-4504354 — "Immersive Systems for Archaeological Parks and Urban-Scale Heritage: A Systematic Review of Augmented and Virtual Reality Across Ancient Cities, Historic Districts, and Participatory Urban Planning". Locations refer to the section numbering of the revised manuscript; tables prefixed with "S" are in the Supplementary Materials (Appendix A of the revised manuscript). Page numbers to be confirmed against the final typeset proof.

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Title
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Abstract
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Sections 1.1–1.3
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Section 1.4 (RQ1–RQ6)
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Section 2.3; grouping for the syntheses in Sections 2.3 and 2.7
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 2.2; Table S1. All five databases last searched 15 July 2026; no registers, websites, organisations or reference lists were searched
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Section 2.2; Table S1
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. One reviewer; no independent duplicate screening; no automation tools
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 2.5. One reviewer; study authors were not contacted; no automation tools
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.	Section 2.5; Table S2
	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.	Section 2.5; Table S2. Missing or unclear information recorded as "not reported"; no imputation
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.	Section 2.6; Table S3b. Five-domain study-type-adapted

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			rubric; one reviewer; no independent duplicate appraisal; no automation tools
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.	Section 2.7. No effect measure was pooled; results are presented in the units reported by each study
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)).	Section 2.7; Table S3a
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Section 2.7. No data conversion was performed
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Section 2.7; Figures 2–4; Tables 1–2; Tables S3a–S3b
	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 2.7. Structured narrative synthesis; no meta-analysis, with the rationale stated
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	Section 2.7. Narrative stratification by modality, domain, scale and delivery setting; no statistical heterogeneity analysis
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	Not applicable. No statistical synthesis was conducted (Section 2.7)
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	Sections 2.7 and 8.6. No funnel plot or outcome-level statistical tool was applicable; residual risk discussed narratively
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Section 2.7. No GRADE-equivalent body-of-evidence rating was performed, with the rationale stated
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.	Section 2.4; Figure 1 (PRISMA 2020 flow diagram)
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Tables S5a–S5b; Section 8.6.

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			The study-level exclusion log was not retained; Table S5b gives an illustrative, non-exhaustive list with reasons
Study characteristics	17	Cite each included study and present its characteristics.	Section 3.6; Table S3a
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Section 3.6; Table S3b
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.	Sections 4–7; Table S3a. Reported in the original units; "NR" marks details not provided by the source reports
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Sections 3–8; Tables S3a–S3b
	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.	Not applicable. No statistical synthesis was conducted (Section 2.7)
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	Not applicable. No statistical synthesis was conducted (Section 2.7)
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	Not applicable. No statistical synthesis was conducted (Section 2.7)
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Section 8.6. Discussed narratively; no statistical assessment was applicable
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	Sections 2.7 and 8.6. No certainty rating was produced; the reasons are stated
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Sections 5–8
	23b	Discuss any limitations of the evidence included in the review.	Section 8.6
	23c	Discuss any limitations of the review processes used.	Section 8.6. Single reviewer; no hand-searching or citation searching; exclusion log not retained
	23d	Discuss implications of the results for practice, policy, and future research.	Section 9
OTHER INFORMATION			

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Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Section 2.1. The review was not registered in PROSPERO or any other registry
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Section 2.1. No protocol was prepared or made publicly accessible
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	Not applicable. No registration and no protocol (Section 2.1)
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Funding statement. The research received no external funding
Competing interests	26	Declare any competing interests of review authors.	Conflicts of Interest statement
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.	Data Availability Statement; Tables S1–S5. Search strategy (S1), data-collection dictionary (S2), extracted data (S3a), appraisal (S3b), exclusions (S5a–S5b). No analytic code was generated

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