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STUDY PROTOCOL

REVISED MSCA HOPE - Physical education in hospital schools: A protocol paper for systematic and umbrella reviews with policy framework analysis

[version 2; peer review: 3 approved]

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Abstract

Hospital school programs support educational continuity for children and adolescents during hospitalization, but the provision of physical education (PE) remains inconsistent and is rarely addressed by unified standards. This protocol aims to describe the methods for three complementary components designed to synthesise evidence on PE and related movement interventions in hospital settings and to map the policy frameworks governing PE provision in hospital schools. Tier 1 is an umbrella review of existing systematic reviews on physical activity interventions for hospitalised youth. Tier 2 is a systematic review of primary studies examining PE in hospital-school settings. For Tier 2, PE is operationally defined as a planned movement-based learning experience with an explicit educational purpose that is formally integrated into the hospital-school program or involves educational staff in its planning, delivery or assessment. Therapeutic exercise, rehabilitation and active play without this educational connection will be excluded from Tier 2, although they may be represented in Tier 1. A parallel policy framework analysis will identify and compare relevant laws, regulations, curricula, strategies and

Open Peer Review

Approval Status ✓ ✓ ✓

	1	2	3
version 2 (revision) 27 Aug 2026	✓ view	✓ view	✓ view
version 1 01 Jun 2026	? view	? view	? view

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Any reports and responses or comments on the

guidelines. Separate search strategies will be used for each component across health, education, sport and policy sources, without language or date restrictions. Narrative synthesis will be the primary approach. Meta-analysis will be considered only when at least three independent studies are sufficiently comparable in population, intervention, design, outcome construct and assessment time point. Priority synthesis will distinguish implementation/process evidence from effectiveness outcomes. Safety, implementation and educational participation will be synthesised primarily using narrative, qualitative and mixed-method approaches, whereas physical functioning and psychosocial well-being will be prioritised for quantitative effect synthesis and Grading of Recommendations Assessment, Development and Evaluation (GRADE) when sufficiently comparable evidence is available. The planned reviews are intended to clarify the available evidence and policy landscape and may inform subsequent guideline development for PE in hospital schools. PROSPERO registration: CRD420251156215.

article can be found at the end of the article.

Plain Language summary

Children and adolescents who spend time in hospital often continue their education through hospital school programmes. These programmes help them stay connected with learning, teachers, and classmates. However, physical education is not always included.

This is important because movement, play, exercise, and physical education can support children's physical health, emotional wellbeing, social participation, and learning. In hospital settings, however, physical education can be difficult to organise. Children may have different health conditions, energy levels, treatment schedules, and safety needs. Hospitals and schools may also follow different rules, and there are no shared standards to guide practice.

This study will bring together the best available knowledge on physical education and physical activity for children and adolescents in hospital settings. The researchers will review previous research studies and examine existing policies and guidelines from different countries and organisations. They will look at what has been studied, what seems helpful, what evidence is still missing, and what rules or recommendations already exist.

The study will consider outcomes related to physical health, mental and social wellbeing, learning, clinical conditions, and practical delivery. It will also assess how reliable the available evidence is.

The results will help build a clearer evidence base for future guidance on physical education in hospital schools. The long-term aim is to support teachers, healthcare professionals, schools, families, and policymakers in offering safe, meaningful, and inclusive physical education opportunities for children and adolescents during hospitalisation.

This review protocol is registered in PROSPERO: CRD420251156215.

Keywords
sport science, hospitalised youth, systematic literature review, barriers and facilitators, interprofessional collaboration, physical activity programs, health–education integration, evidence-informed policy.



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REVISED **Amendments from Version 1**

This revised version addresses the reservations raised by the reviewers. The Introduction has been condensed and refocused on the specific evidence and policy gap. A new terminology table and screening decision rule now distinguish physical education from physical activity, therapeutic exercise, rehabilitation and active play. For Tier 2, an explicit educational purpose is mandatory, together with formal hospital-school integration or documented educational-staff involvement. Separate search strategies are now specified for the umbrella review, primary-study review and policy framework analysis. The policy component now defines eligible document types, standardised country-level searching, documentation of expert consultation and procedures to reduce selection bias. Appraisal of Guidelines for Research and Evaluation, Version II (AGREE II) is restricted to guideline-like documents, while other policy and grey-literature sources will be appraised using document-appropriate criteria. Narrative synthesis is identified as the primary approach; the priority domains are now organised into complementary implementation/process and effectiveness/outcome synthesis strands, while quantitative pooling remains limited to at least three sufficiently comparable studies and Grading of Recommendations Assessment, Development and Evaluation (GRADE) is applied to coherent bodies of comparative outcome evidence. The qualitative synthesis now specifies coding, reviewer calibration, theme development and an audit trail, with all decisions remaining under human responsibility. The repeated two-reviewer descriptions have been consolidated in a reviewer-workflow table. The certainty assessment, Discussion and conclusion have been revised to be more focused and cautious. Figure 1 and the description of the tiered design have also been updated. Two new extended-data files provide the complete planned database strategies and the operational protocol for the policy framework analysis; the Zenodo record and DOI have been updated accordingly.

Any further responses from the reviewers can be found at the end of the article

1. Introduction

Hospital schools provide educational services to children and adolescents whose treatment interrupts regular schooling, helping to preserve learning, peer connection and a sense of normality during hospitalization (Issaka and Hopkins, 2015; Jiliberto and Zarate Alva, 2024). Whilst form and resourcing of these services vary across health and education systems, physical education (PE) is frequently omitted because of limited space, equipment, specialist staff and time, together with concerns about medical safety and coordination with clinical care (Catenazzo, 2019; Catenazzo, 2024; Cistulli et al., 2025).

PE is a curriculum area with explicit learning aims related to movement competence, knowledge and understanding, meaningful participation, and personal and social development (McLennan and Thompson, 2015; Opstoel et al., 2020; GloPL Consortium, 2026). It is therefore conceptually distinct from physical activity as a broad behaviour of bodily movement resulting in energy expenditure (World Health Organization, 2022; Ciaccioni et al., 2026a), from therapeutic exercise or rehabilitation prescribed primarily to address symptoms, impairments, functioning, or other health-related needs (Taylor et al., 2007; Gutenbrunner et al., 2011) and from recreational or play-based movement that may occur without explicit curricular learning objectives (Pellegrini and Smith, 1998; Martins et al., 2021). Although these activities may overlap in hospital settings, they differ in their primary purposes, intended learning or clinical outcomes, and the professional responsibilities associated with their planning and delivery. Consequently, evidence from clinical exercise programs can inform, but cannot automatically be interpreted as evidence for PE provision within hospital schools.

Research on hospital-based movement is dispersed across education, paediatric rehabilitation, psychology, nursing and sport sciences. Existing reviews have generally examined physical activity or therapeutic exercise in specific clinical groups rather than PE as an educational provision (Dixon, 2020; Ludgério et al., 2023; Theobald et al., 2025). In parallel, international commitments support inclusive education and participation for hospitalised children, but the extent to which laws, curriculum frameworks and implementation guidance address PE in hospital schools has not been systematically mapped (McLennan and Thompson, 2015; UNESCO, 2015; European Parliament, 2016; European Commission, 2025). Consequently, the evidence base and the policy environment remain difficult to interpret together.

In response to these gaps, a multi-component review has been designed to consolidate evidence and policy information on PE in hospital schools. The objectives are to: (i) identify and describe the characteristics, and delivery models of PE interventions in hospital-school settings; (ii) summarise evidence concerning their safety, feasibility and physical, psychosocial, and educational outcomes; (iii) synthesize systematic-review evidence on broader hospital-based physical activity interventions that may offer transferable insights; (iv) map international, national and regional policy and regulatory provisions relevant to PE in hospital schools, including professional preparation and intersectoral responsibilities; (v) integrate empirical and policy findings to identify areas of convergence, divergence and uncertainty.

Thus, developed within the framework of the MSCA Global Postdoctoral Fellowship project "Hospital schools' guidelines On Physical Education" (HOPE; https://cordis.europa.eu/project/id/101206417), this protocol is intended to provide an evidence-informed foundation for later guideline development.

2 Methods and analysis

2.1 Review structure

The present protocol was prospectively registered in the International Prospective Register of Systematic Reviews (PROSPERO) on 04 December 2025 (registration number: CRD420251156215). The preparation and reporting of this protocol manuscript were conducted in accordance with the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P; see Extended Data: (Ciaccioni et al., 2026b)) guidelines (Shamseer et al., 2015). The plan comprises two evidence-synthesis tiers and a parallel policy framework analysis. The components will be conducted separately using purpose-specific eligibility criteria, searches, appraisal methods and syntheses, and will be integrated only at the interpretation stage (Tenenbaum and Driscoll, 2005; Bowen, 2009; Browne et al., 2019).

- Tier 1: Umbrella review of systematic reviews. This component will include systematic reviews with or without meta-analyses, that use explicit eligibility criteria and reproducible search methods to examine physical activity, exercise, and movement-based interventions delivered to hospitalised children and adolescents. Its purpose is to summarise higher-level evidence on benefits, harms, and implementation considerations that may be relevant, but not necessarily directly transferable, to hospital-school PE.

- Tier 2: Systematic review of primary studies. This component will include quantitative, qualitative, and mixed-methods primary studies of PE in formal hospital school or hospital-associated educational programs. Because the field is expected to be small, eligible designs will include randomised and non-randomised studies, observational studies, qualitative studies, mixed-methods studies, and case reports or series that provide sufficient information on a structured PE intervention or its implementation. Descriptive and case-based evidence will be used for mapping and narrative interpretation rather than pooling estimates of effectiveness.

- Policy framework analysis. A structured document analysis will identify binding and non-binding instruments relevant to PE or movement provision in hospital education. Eligible sources will include legislation, regulations, ministerial decrees or circulars, curriculum frameworks, national or regional strategies, official standards, implementation guidance and international normative or recommendation documents. Expert consultation will be used only to identify potentially missing documents; expert opinions will not be analysed as data.

Figure 1 presents the concurrent design. Tier 1 provides the broader hospital-based physical activity context, Tier 2 focuses specifically on PE as educational provision in hospital-school settings, and the policy analysis examines the governance context. Findings will be compared through a predefined integration framework addressing convergence, divergence, transferability and gaps, without combining unlike forms of evidence into a single effect estimate.

2.2 Eligibility criteria

Eligibility criteria were developed using the Population, Intervention, Comparator, Outcomes and Study design (PICOS) framework, with an additional Context criterion (Brown et al., 2006). The terminology and Tier 2 screening decision rule are presented in Table 1. The definitions are intended to prevent educational PE from being conflated with clinical treatment or unstructured recreation while allowing transparent assessment of interventions that combine educational and therapeutic elements.

Population and context: Tier 2 will include children and adolescents of compulsory or upper-secondary school age, approximately 5 to 18 years, who receive education during inpatient care or through a hospital-associated educational program. All diagnoses, treatment pathways and countries will be eligible. Home or outpatient education will be excluded unless it forms part of a documented hospital-school transition or reintegration program. Tier 1 will include systematic reviews of hospitalised children and adolescents, whether or not the intervention is connected to schooling.

Interventions: A Tier 2 intervention must have an explicit educational purpose, such as curriculum-related learning, development of movement competence, knowledge, participation, self-regulation or personal and social learning through movement. In addition, it must either be formally scheduled or documented within the hospital-school program, or involve a teacher, PE professional or other educational staff member in planning, delivery or assessment. Frequency, intensity, duration, group size and mode of delivery will not determine eligibility.

Therapeutic exercise, physiotherapy, rehabilitation and active play will be included in Tier 2 only when they meet the educational decision rule in Table 1. Programs delivered solely as medical treatment, symptom management or recreation without an explicit educational objective will be excluded from Tier 2 but may be represented in Tier 1 through an eligible systematic review. Borderline cases will be independently assessed by two reviewers using the decision rule; study authors will be contacted when the educational purpose or organisational linkage cannot be determined from the report.

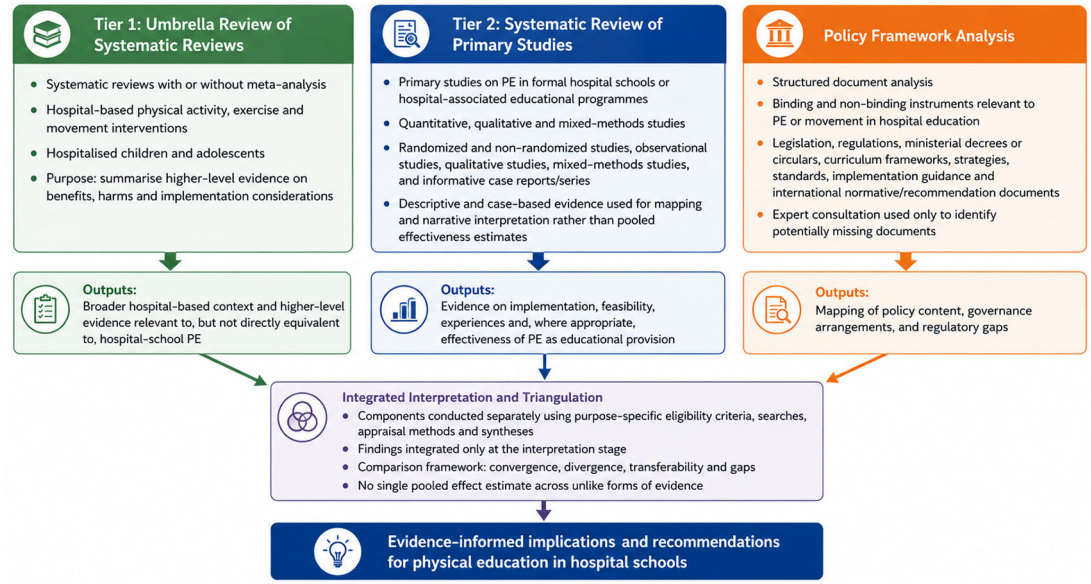

Figure 1. Overview of the concurrent multi-tier design and evidence integration. Note: PE: Physical education; PROSPERO: International Prospective Register of Systematic Reviews; PRISMA-P: Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols.

Table 1. Operational terminology and Tier 2 screening decision rule.

Term	Operational meaning in this protocol	Tier 2 eligibility
Physical education	Planned movement-based learning with explicit educational aims related to curriculum, movement competence, knowledge, participation, self-regulation, or personal and social development.	Eligible when the educational purpose is explicit and the activity is either formally integrated into the hospital-school program or involves educational staff in planning, delivery or assessment.
Physical activity	Any bodily movement that increases energy expenditure, irrespective of purpose or setting.	Eligible only when it also meets the PE educational decision rule. Otherwise, it may be relevant to Tier 1.
Exercise or therapeutic exercise	Planned and structured activity undertaken primarily to improve fitness, symptoms, function or health.	Eligible only when it has an explicit educational purpose and a documented hospital-school connection. Clinically prescribed exercise alone is excluded.
Rehabilitation or physiotherapy	Clinical assessment and treatment intended to restore or maintain function.	Excluded when delivered solely as healthcare. Included only when formally integrated with educational aims and the hospital-school program.
Active play or recreation	Enjoyable spontaneous or structured movement primarily intended for play, leisure or social interaction.	Eligible only when educational objectives and hospital-school integration are documented.
Borderline cases	Activities combining educational, therapeutic and recreational purposes.	Criterion A, explicit educational purpose, is mandatory. In addition, criterion B, formal hospital-school integration, or criterion C, documented educational-staff involvement, must be present. Unclear cases will undergo duplicate full-text assessment and author contact where feasible.

Note. PE: Physical education.

Comparator: A comparator will not be required because qualitative studies, single-group evaluations and descriptive designs are expected. When available, comparators such as usual care, non-PE educational activities, alternative movement programs or pre-intervention measurements will be extracted and considered in design-specific syntheses.

Outcomes: Priority outcomes will be organised into two complementary synthesis strands. The implementation/process strand will prioritise (i) safety and feasibility/implementation, including adverse events, and (ii) educational participation or engagement; these findings will be synthesised using quantitative descriptive, qualitative and mixed-method evidence, as appropriate. The effectiveness/outcome strand will prioritise (iii) physical functioning or motor competence and (iv) psychosocial well-being or health-related quality of life; these domains will be prioritised for comparative quantitative synthesis and GRADE assessment when the prespecified criteria for quantitative synthesis are met. Comparative evidence concerning safety or educational participation may also undergo quantitative synthesis and GRADE assessment when a sufficiently coherent body of evidence is available. Other clinical, cognitive, academic and implementation outcomes will be mapped and synthesised narratively.

Study Designs: Tier 1 will include systematic reviews and meta-analyses with an explicit search strategy, eligibility criteria and reproducible selection process. Narrative, scoping or integrative reviews will be excluded unless they meet these minimum systematic-review criteria. Tier 2 will include randomised trials, quasi-experimental and other non-randomised intervention studies, cohort, case-control and cross-sectional studies, qualitative studies, mixed-methods studies, and informative case reports or series. Protocols, editorials, commentaries and conference abstracts without sufficient outcome or implementation data will be excluded.

No restrictions will be applied by country, language, publication year, medical condition or length of stay. Contextual information, including the type and governance of the hospital school, educational staffing, clinical collaboration, resources and transition arrangements, will be extracted because these features may influence feasibility and transferability (Pesce et al., 2021; Ciaccioni et al., 2025).

2.3 Data sources and search strategy

Separate search strategies will be developed for the umbrella review, the primary-study systematic review and the policy framework analysis because the components address different questions and evidence sources. Table 2 summarises the operational structure; complete line-by-line strategies for each database and operational procedures for policy framework analysis are reported as extended data (Ciaccioni et al., 2026a).

- Tier 1 strategy. Searches will not include hospital-school terms as a mandatory concept because the purpose is to capture the broader hospital-based evidence. Reviews will be screened against the methodological and population criteria stated above, and the reference lists and citing literature of included reviews will be examined.

Table 2. Component-specific search framework.

Component	Operational search structure
Tier 1: umbrella review	Sources: MEDLINE, Embase, CINAHL, PsycINFO, Scopus, Web of Science, SPORTDiscus and the Cochrane Database of Systematic Reviews. Concepts: child or adolescent AND hospital or inpatient AND physical activity, exercise, sport, movement or rehabilitation AND systematic-review terms. Hospital-school terminology will not be mandatory.
Tier 2: primary-study review	Sources: MEDLINE, Embase, CINAHL, PsycINFO, Scopus, Web of Science, SPORTDiscus, ERIC, Education Source and CENTRAL. Concepts: hospital school or in-hospital education AND physical education, physical activity, exercise, movement, sport or active play AND child or adolescent. No study-design filter will be applied.
Policy framework analysis	Sources: official international, European, national and regional organisation websites; ministries of education and health; legal databases; curriculum authorities; Youth Wiki; and recognised hospital-school networks. Concepts will combine hospital schooling or education during illness with PE, physical activity, movement, sport, curriculum, law, regulation, strategy, guideline and implementation terms in English and relevant local languages.

Note. CENTRAL: Cochrane Central Register of Controlled Trials; CINAHL: Cumulative Index to Nursing and Allied Health Literature; Embase: Excerpta Medica Database; ERIC: Education Resources Information Center; MEDLINE: Medical Literature Analysis and Retrieval System Online; PE: Physical Education.

- Tier 2 strategy. Search sensitivity will be prioritised because hospital-school PE may be described using educational, clinical or recreational terminology. Broad movement terms will therefore be retained at the search stage, while the educational decision rule in Table 1 will be applied during full-text screening.

- Policy strategy and documentation. A common country-search template will specify the official domains searched, English and local-language terms, document categories, dates searched, result counts and reasons for exclusion. Search strings will combine hospital schooling or education during illness with PE, physical activity, movement, sport, curriculum and implementation terms. Where website search functions are inadequate, targeted web searches restricted to official domains will be used. Superseded documents will be retained only when needed to explain policy development and will be clearly labelled as historical.

Supplementary identification methods will include backward and forward citation searching, searches of relevant repositories and doctoral theses, and consultation with hospital educators, researchers and policy stakeholders. All expert contacts will receive the same written request. The search log will record the expert's role, country, date of contact and nominated documents. A nominated document will be included only after independent eligibility verification and source authentication.

No date or language restrictions will be applied. Titles and abstracts in languages not spoken by the review team will be assessed using professional translation, institutional language support or verified machine translation as appropriate. Key eligibility, extraction and appraisal decisions will be checked by a reviewer able to assess the original language whenever feasible.

Database records will be exported to MS Excel (Microsoft 365), deduplicated and assigned to the relevant component. Searches will be rerun before final synthesis. The final reports will provide the complete strategies, dates, platforms, filters, deduplication procedures and any deviations from this protocol.

2.4 Use of artificial intelligence and automation tools

Any automation or artificial intelligence functionality will be used, if at all, only for supportive tasks such as deduplication, record organisation, translation support or citation prioritisation (Thomas et al., 2026). Automated outputs will not determine eligibility, extraction, appraisal, coding, theme development, certainty ratings or interpretation. Reviewers will verify all outputs and retain direct responsibility for every methodological decision. The tool name, developer, version, purpose, date of use, input type, verification procedure and any detected errors will be documented in the final report.

2.5 Screening and study selection

The reviewer workflow is summarised in Table 3 and will apply separately to Tier 1, Tier 2 and the policy component. Before formal screening, reviewers will pilot the eligibility criteria on a shared sample and refine the guidance without altering the registered review questions. Titles and abstracts, followed by full texts, will be assessed independently by two reviewers. Disagreements will be resolved through discussion and, when necessary, adjudication by a third reviewer. Full-text exclusions and reasons will be recorded, and selection will be reported using component-specific PRISMA flow diagrams. Authors will be contacted when essential eligibility information is unclear.

2.6 Data extraction

Component-specific extraction forms will be developed, piloted and accompanied by a coding manual (Khudair et al., 2022; Lee et al., 2025a; Lee et al., 2025b). For Tier 2, extracted items will include publication and design, country and hospital-school context, participant characteristics and diagnoses, educational purpose, intervention content and dose, delivery personnel and professional preparation, curriculum linkage, comparator, outcomes and instruments, time points, numerical or qualitative findings, adverse events, implementation processes, barriers and facilitators, funding and conflicts of interest.

For Tier 1, extraction will cover review objectives, databases and search dates, eligibility criteria, included study designs and populations, intervention categories, outcomes, synthesis methods, effect estimates, adverse events, implementation findings, certainty assessments and authors' conclusions. Primary-study overlap across included reviews will be mapped and quantified using the Corrected Covered Area (Higgins et al., 2023). No new meta-analysis will combine pooled estimates from overlapping reviews.

For policy documents, extraction will record the document title, issuing authority, jurisdiction, legal or administrative status, date, current or superseded status, target population, references to PE or related movement provision, curricular

Table 3. Reviewer workflow across the three review components.

Stage	Reviewer process	Resolution and documentation
Search validation	A second reviewer or information-search lead will check each strategy against the relevant eligibility criteria before execution.	Search versions, dates, platforms and amendments will be retained in the search log.
Title, abstract and full-text screening	Two reviewers will assess records independently after a shared calibration exercise.	Disagreements will be resolved by consensus or third-reviewer adjudication; full-text exclusion reasons will be recorded.
Data extraction	One reviewer will extract data and a second reviewer will verify all fields against the source.	Discrepancies and author contacts will be documented.
Risk of bias and critical appraisal	Two reviewers will appraise each included unit independently using the tool appropriate to its design or document type.	Consensus or third-reviewer adjudication; domain-level judgments will be retained.
Qualitative synthesis	Two reviewers will independently code a diverse calibration sample; one will code the remaining findings and the second will verify coding and themes.	A codebook, reflexive notes, divergent cases and theme revisions will form an audit trail.
Certainty assessment	Two reviewers will independently prepare GRADE or GRADE-CERQual judgments for predefined priority findings.	Consensus or third-reviewer adjudication; reasons for judgments will be reported.
Policy-document analysis	Two reviewers will independently confirm eligibility; one will extract and a second will verify.	Expert nominations will be logged and subjected to the same eligibility and authenticity checks as documents found through standard searches.

Note. GRADE: Grading of Recommendations Assessment, Development and Evaluation; CERQual: Confidence in the Evidence from Reviews of Qualitative research.

expectations, professional roles, safety and adaptation requirements, funding or resource provisions, implementation and monitoring mechanisms, and links between education and health authorities. Direct quotations will be limited to short excerpts required to support interpretation.

One reviewer will extract each record and a second reviewer will verify all fields against the source. Discrepancies will be resolved according to Table 3. When multiple reports describe the same study or policy instrument, they will be linked and treated as one unit of evidence. Authors or issuing bodies may be contacted for missing information, but unverified information will not replace the published or official record.

2.7 Risk of bias and quality assessment

Critical appraisal will be selected according to evidence type and will be completed independently by two reviewers as specified in Table 3. Appraisal results will inform synthesis, certainty assessment and interpretation but will not be used as an automatic exclusion threshold.

Randomised trials will be assessed with Cochrane Risk of Bias 2 (RoB 2), and non-randomised intervention studies with Risk Of Bias In Non-randomized Studies of Interventions (ROBINS-I) (Sterne et al., 2016; Sterne et al., 2019). Observational and case-based quantitative evidence will be assessed using the Joanna Briggs Institute (JBI) critical appraisal instrument appropriate to the reported design (https://jbi.global/critical-appraisal-tools). Mixed-methods studies will be appraised through the Mixed Methods Appraisal Tool-MMAT (Hong et al., 2018).

Qualitative studies will be appraised with the Critical Appraisal Skills Programme checklist, with attention to the appropriateness of the design, recruitment, data collection, reflexivity, analysis, ethical considerations and coherence between data and interpretation (Long et al., 2020).

Systematic reviews included in Tier 1 will be appraised using AMSTAR 2 (Shea et al., 2017). The review team will also examine the recency and scope of each review, the risk of bias of its included studies, and overlap between reviews. Conclusions from critically low-quality reviews will not be treated as equivalent to conclusions from reviews with stronger methods.

Policy and regulatory documents will be appraised according to document type. AGREE II will be used only for documents that meet the characteristics of a practice or implementation guideline (Brouwers et al., 2010). Policy texts will be assessed using the JBI approach for textual policy evidence, including credibility, authority, purpose, evidence base and transparency of development (McArthur et al., 2025). Grey-literature source characteristics will additionally be documented using the Authority, Accuracy, Coverage, Objectivity, Date, Significance (AACODS) Checklist (Seniutis et al., 2026; Tyndall, 2010). For laws and regulations, their issuing authority, legal force, currency, scope, accessibility and implementation provisions will be recorded.

Appraisal judgments will be presented by domain; sensitivity analyses or structured comparisons will examine whether conclusions differ when evidence at high or critical risk of bias is omitted, provided sufficient studies are available.

2.8 Data synthesis and analysis

Narrative synthesis will be the primary approach for both review tiers because heterogeneity is expected in settings, populations, educational purposes, interventions, designs and outcomes. Tier 1 findings will be summarised by review scope and quality, with explicit attention to primary-study overlap and transferability to hospital-school PE. For Tier 2, synthesis will distinguish implementation/process evidence from effectiveness/outcome evidence. Safety, feasibility, implementation and educational participation or engagement will primarily be integrated through narrative, qualitative and, where appropriate, mixed-method synthesis. Physical functioning or motor competence and psychosocial well-being or health-related quality of life will be prioritised for comparative quantitative synthesis. This distinction is analytical rather than absolute, as sufficiently comparable comparative data on safety or educational participation may also support quantitative synthesis. Policy documents will first be synthesised by jurisdiction, document type, legal status and substantive provision, followed by cross-jurisdictional comparison.

Meta-analysis will be considered only when at least three independent studies are sufficiently comparable in population, intervention purpose and content, design, comparator, outcome construct and assessment time point, and when effect estimates can be derived without double-counting participants. Randomised and non-randomised studies will not be pooled together. Random-effects models will be used, with risk ratios or odds ratios for dichotomous outcomes and mean differences or standardised mean differences for continuous outcomes, each with 95% confidence intervals. Statistical heterogeneity will be examined using I-squared and tau-squared, but pooling decisions will be based primarily on clinical, educational and methodological comparability. Subgroup and sensitivity analyses will be undertaken only when adequately supported and will prioritise age group, clinical condition, intervention type, delivery professional and risk of bias. Publication-bias analyses will be considered only when the number of studies is sufficient for meaningful interpretation (Higgins et al., 2023; Borenstein et al., 2021).

Qualitative findings will be synthesised using the three-stage thematic-synthesis process of line-by-line coding, development of descriptive themes and generation of analytical themes (Thomas and Harden, 2008; Green and Thorogood, 2018). Two reviewers will independently code an initial sample representing different settings and participant perspectives, compare interpretations and agree a provisional codebook. One reviewer will then code the remaining findings and the second will verify coding and theme development. Reflexive notes, coding decisions, divergent cases and changes to the codebook will be retained in an audit trail. Participant quotations and study-author interpretations will be distinguished. Policy and empirical syntheses will subsequently be integrated in a matrix examining convergence, divergence, implementation conditions, transferability and unresolved gaps.

2.9 Certainty of evidence assessment

GRADE will be applied to sufficiently coherent bodies of comparative quantitative evidence, with physical functioning or motor competence and psychosocial well-being or health-related quality of life designated as the primary domains for quantitative certainty assessment. Safety/adverse events and educational participation or engagement will also be assessed using GRADE when they are reported as sufficiently comparable comparative outcomes; otherwise, they will contribute primarily to the implementation/process synthesis. Separate certainty judgments will be made by study design and outcome, considering risk of bias, inconsistency, indirectness, imprecision and publication bias, with upgrading factors applied where appropriate. GRADE-CERQual (Confidence in the Evidence from Reviews of Qualitative research) will be applied to a limited set of priority qualitative findings concerning safety, acceptability, barriers, facilitators, educational participation and engagement, and stakeholder experience, considering methodological limitations, coherence, adequacy and relevance (Lewin et al., 2018; Brozek et al., 2021; Kolovelonis et al., 2024). Certainty will not be assigned to isolated case reports, purely descriptive mappings or legal obligations. Summary-of-findings tables will report the rationale for each judgment and distinguish evidence from Tier 1, Tier 2 and the policy analysis.

3. Discussion

This protocol addresses an under-synthesised area at the intersection of education, health and physical activity. Its central methodological challenge is that PE, clinical exercise, rehabilitation and active play may coexist in hospital settings while serving different purposes (Issaka and Hopkins, 2015; West et al., 2019; Cistulli et al., 2025) with operational definitions and decision rules intended to preserve the educational focus of Tier 2 while allowing Tier 1 to provide a broader clinical and implementation context.

The multi-component design may clarify how PE has been conceptualised and delivered, which outcomes have been assessed, and which implementation conditions have been reported. However, the review will not assume that hospital-based physical activity programs are educationally equivalent to PE or that evidence from one diagnosis, profession or healthcare system is transferable to another (Reid, 2010; Braam et al., 2016; Santos et al., 2020; Crowder et al., 2022). Transferability will be examined explicitly with reference to educational purpose, clinical constraints, staffing and governance.

The policy analysis may help explain whether variation in provision is associated with the presence or absence of curriculum requirements, professional responsibilities, safety guidance, intersectoral coordination or implementation resources. Its interpretation will distinguish legal obligations from recommendations and practice guidelines. The analysis is intended to identify policy patterns and gaps rather than rank countries or infer implementation solely from the existence of a document (European Union, 2008; European Commission, 2023; Amornsriwatanakul et al., 2025).

Several limitations are anticipated. The empirical evidence may be sparse, heterogeneous and at risk of bias, which may preclude quantitative pooling and result in low-certainty conclusions. Terminology may be inconsistent, relevant educational activities may be reported in clinical literature, and policy documents may be difficult to locate, translate or compare across legal systems. Standardised searches, transparent decision rules, duplicate screening, document-type-specific appraisal and an audit trail are intended to reduce, but cannot eliminate, these limitations. Expert consultation may improve document identification, although it may introduce unequal coverage across jurisdictions; expert nominations will therefore remain supplementary to the standardised search and will undergo the same eligibility checks (Browne et al., 2019; Brozek et al., 2021; Higgins et al., 2023).

The completed reviews are intended to provide a transparent account of the available evidence and policy landscape. Depending on the findings and their certainty, they may inform subsequent stakeholder consultation, research priorities and the development of context-sensitive guidance for PE in hospital schools. They will not, by themselves, establish universal implementation standards (Kohl III et al., 2013; Longmuir et al., 2013; American Public Health Association, 2021; World Health Organization, 2010).

Ethics and dissemination

This multi-tiered review (encompassing a systematic review, umbrella review, and policy framework analysis) will rely exclusively on secondary data from published studies and publicly available policy documents. No primary data collection involving human participants will be conducted, and thus no formal ethics approval is required.

The results will be disseminated in peer-reviewed publications, conference presentations, open repositories and targeted materials for hospital-school educators, healthcare professionals and policy stakeholders. Dissemination products will distinguish review findings from subsequent recommendations and will report uncertainty, contextual limitations and evidence gaps.

Data availability statement

The manuscript contains the following Extended Data: Ciaccioni S, Pesce C, Benzing V, Schmidt M, Magalhães P, Rosário P, Pedrosa Leal L, Pontes CM, Oddi L, Basciano M, Betello F, Bradic S & Capranica L: Extended data for "MSCA HOPE - Physical education in hospital schools: A protocol paper for systematic and umbrella reviews with policy framework analysis". *Zenodo*; 2026. https://doi.org/10.5281/zenodo.21825405.

Data are available under the terms of the Creative Commons Zero "No rights reserved" data waiver (CC0 1.0 Public domain dedication).

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have been a central source of motivation for this project and have continuously reminded us of the importance of promoting health, education, and well-being in hospital settings.

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Open Peer Review

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Version 2

Reviewer Report 09 September 2026

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✔ **Francesca Greco**
Department of Experimental and Clinical Medicine, University “Magna Græcia” of Catanzaro, Catanzaro, Italy

Authors fully addressed my previous comments.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Exercise science researcher

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Reviewer Report 04 September 2026

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✔ **Federico Roggio**
Department of Biomedical and Biotechnological Sciences, Section of Anatomy, Histology and Movement Science, School of Medicine,, University of Catania, Catania, Italy

The authors have adequately addressed the comments raised in my previous review. In particular, the revised manuscript now provides clearer operational definitions and eligibility criteria for physical education, a more reproducible component-specific search strategy, a proportionate synthesis plan, a substantially strengthened policy framework analysis, and clearer procedures for qualitative synthesis and reviewer responsibilities. The revised wording is also more consistent

with the prospective nature of a protocol paper. I consider my previous concerns satisfactorily resolved and have no further substantive comments.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Public health - human movement sciences

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Reviewer Report 31 August 2026

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Henri Tilga
Institute of Sport Sciences and Physiotherapy, Faculty of Medicine, University of Tartu, Tartu, Estonia

Authors have done well in revising their manuscript.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Physical education

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Version 1

Reviewer Report 29 July 2026

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Francesca Greco
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Catanzaro, Italy

Thank you for the opportunity to evaluate this manuscript. This protocol addresses an important and insufficiently explored area that lies at the intersection of hospital education, paediatric health, and educational policy.
Overall, the protocol is well conceived and addresses a relevant research question. However, some methodological aspects would benefit from further refinement. Please find my suggestions below:

1- Please better define the range of concepts used in the protocol. Specifically, it would be beneficial to better elucidate the meaning of physical education. It could nbe useful to include a decision framework for study selection.
2 - The criteria for undertaking quantitative
3 - The policy analysis represents one of the protocol's most innovative components but currently lacks sufficient methodological detail. The authors should clearly define the types of policy documents that will be considered eligible and explain the procedures that will be used to identify grey literature.
4 -The wording throughout the manuscript should consistently distinguish between planned methods and future outcomes.

Is the rationale for, and objectives of, the study clearly described?
Yes

Is the study design appropriate for the research question?
Yes

Are sufficient details of the methods provided to allow replication by others?
Partly

Are the datasets clearly presented in a useable and accessible format?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Exercise science researcher

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 17 Aug 2026

Simone Ciaccioni

Dear Dr Greco,
We sincerely thank you for your positive assessment and constructive recommendations. Your comments helped us improve the conceptual clarity, methodological detail, reproducibility, and protocol-oriented wording of the manuscript. Our point-by-point responses are provided below.

Comment 1. Definition of concepts and decision framework
Please better define the range of concepts used in the protocol. Specifically, it would be beneficial to better elucidate the meaning of physical education. It could be useful to include a decision framework for study selection.

Response:
We agree and have substantially clarified the conceptual boundaries between physical education, physical activity, therapeutic exercise, rehabilitation, and active play. A new terminology and screening decision table, now presented as Table 1, defines each concept and specifies its eligibility for Tier 2. Physical education is operationally defined as planned movement-based learning with explicit educational aims related to curriculum, movement competence, knowledge, participation, self-regulation, or personal and social development. For inclusion in Tier 2, an intervention must have an explicit educational purpose and must also meet at least one of the following criteria:

1. formal integration into the hospital-school programme; or
2. documented involvement of educational staff in planning, delivery, or assessment.

Therapeutic exercise, physiotherapy, rehabilitation, and active play delivered solely for clinical treatment, symptom management, or recreation will be excluded from Tier 2, although they may be represented in Tier 1 through eligible systematic reviews. The new decision framework also addresses borderline interventions combining educational, therapeutic, and recreational purposes. These cases will undergo independent duplicate full-text assessment, and study authors will be contacted where the educational purpose or hospital-school connection cannot be determined from the published report.

Comment 2. Criteria for quantitative synthesis
The reviewer's second comment appears to be incomplete in the published report: "The criteria for undertaking quantitative…". We interpreted this as a request to clarify the conditions under which quantitative synthesis or meta-analysis would be undertaken.

Response:
We have revised the synthesis plan to identify narrative synthesis as the primary analytical approach. Meta-analysis will be considered only when at least three independent studies are sufficiently comparable in relation to:

- population;
- intervention purpose and content;
- study design;
- comparator;
- outcome construct; and
- assessment time point.

Randomised and non-randomised studies will not be pooled together, and quantitative synthesis will not be undertaken when it would result in double-counting participants. Decisions concerning pooling will be based primarily on clinical, educational, and methodological comparability rather than statistical heterogeneity alone. Case reports, case

series, and descriptive evidence will be used for evidence mapping and narrative interpretation rather than pooled effectiveness estimates. We have also organised the predefined priority domains into two complementary synthesis strands. Safety and feasibility/implementation, together with educational participation or engagement, will primarily contribute to an implementation/process synthesis drawing on quantitative descriptive, qualitative and mixed-method evidence. Physical functioning or motor competence and psychosocial well-being or health-related quality of life will be prioritised for comparative quantitative synthesis and GRADE assessment. However, this distinction is not absolute: safety or educational participation outcomes will also be eligible for quantitative synthesis and GRADE when sufficiently comparable comparative evidence is available. This structure is intended to keep the synthesis proportionate to the anticipated evidence base while avoiding the application of the same analytical approach to conceptually different types of evidence.

Comment 3. Policy analysis and grey literature
The policy analysis represents one of the protocol's most innovative components but currently lacks sufficient methodological detail. The authors should clearly define the types of policy documents that will be considered eligible and explain the procedures that will be used to identify grey literature.

Response:
We agree and have expanded the policy-analysis methods throughout the manuscript and in a dedicated extended-data protocol. Eligible documents are now explicitly defined as binding and non-binding instruments, including:

- legislation;
- regulations;
- ministerial decrees and circulars;
- curriculum frameworks;
- national and regional strategies;
- official standards;
- implementation guidance; and
- international normative or recommendation documents.

Grey-literature searches will follow a standardised country-level procedure documenting the official domains searched, English and local-language terms, document categories, dates searched, result counts, and reasons for exclusion. Sources will include ministries of education and health, legal databases, curriculum authorities, official international and regional organisations, Youth Wiki, and recognised hospital-school networks. Where the internal search functions of official websites are inadequate, targeted web searches restricted to official domains will be used. Expert consultation will serve only as a supplementary method for identifying potentially missing documents. All experts will receive the same written request, and their role, country, date of contact, and nominated documents will be recorded. Each nominated document will undergo the same eligibility and source-authentication procedures as documents identified through the standard searches. The appraisal approach has also been differentiated by document type. AGREE II

will be used only for practice or implementation guidelines. Other policy texts will be assessed using the JBI approach for textual policy evidence, supplemented by AACODS criteria for grey literature. Laws and regulations will be characterised according to issuing authority, legal force, currency, scope, accessibility, and implementation provisions.

Comment 4. Distinction between planned methods and future outcomes
The wording throughout the manuscript should consistently distinguish between planned methods and future outcomes.

Response:
We agree and have revised the wording throughout the Abstract, Introduction, Discussion, conclusion, and dissemination sections. Statements that appeared to anticipate the findings or impact of the future reviews have been replaced with more cautious protocol-oriented formulations. For example, the manuscript now states that the reviews are “intended to” clarify the evidence and policy landscape and “may inform” subsequent stakeholder consultation, research priorities, and guideline development. The revised Discussion also acknowledges that the available evidence may be sparse, heterogeneous, and at risk of bias and clarifies that the reviews will not, by themselves, establish universal implementation standards. This wording more clearly distinguishes planned procedures, possible findings, and potential future applications.

Are sufficient details of the methods provided to allow replication by others? Original assessment: Partly

Response:
To improve reproducibility, we added operational eligibility definitions, a Tier 2 screening decision framework, component-specific search procedures, explicit quantitative-synthesis thresholds, document-type-specific policy appraisal methods, and more detailed procedures for qualitative synthesis and reviewer responsibilities. Two new extended-data files also provide the complete planned database strategies and the operational protocol for the policy framework analysis. The updated materials are available through the revised Zenodo record: https://doi.org/10.5281/zenodo.21825405 We again thank the reviewer for the constructive recommendations, which have helped us strengthen the clarity, transparency, and reproducibility of the protocol.

Competing Interests: No competing interests were disclosed.

Reviewer Report 30 June 2026

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Henri Tilga
Institute of Sport Sciences and Physiotherapy, Faculty of Medicine, University of Tartu, Tartu, Estonia

Overall, this protocol addresses a highly relevant and timely topic by focusing on physical education within hospital school settings, an area that has received remarkably limited scientific attention despite its potential educational, physical, and psychosocial importance. The proposed integration of a systematic review, an umbrella review, and a policy framework analysis represents a novel and comprehensive methodological approach that has the potential to make a meaningful contribution to both research and practice. The manuscript is generally well organized, the rationale is convincing, and the protocol follows recognized methodological standards, including PRISMA-P and PROSPERO registration. Nevertheless, several aspects could be further strengthened to improve methodological transparency, conceptual clarity, and overall readability before the review is conducted.

Please consider strengthening the conceptual distinction between physical education, physical activity, therapeutic exercise, rehabilitation, and play-based movement throughout the manuscript. Although these concepts are acknowledged as related, the eligibility criteria suggest that they may overlap considerably during study selection, particularly within Tier 2. A clearer operational definition of physical education in hospital school settings would reduce ambiguity and improve the reproducibility of the review process. Perhaps the authors could explicitly define the essential characteristics that distinguish educational physical education interventions from therapeutic or clinical exercise programmes while also explaining how borderline cases will be handled during screening.

The Introduction provides an appropriate justification for the importance of physical education during hospitalization; however, several arguments regarding the physical, psychological, educational, and social benefits of physical activity are repeated throughout the section. Please consider condensing these recurring statements and directing greater attention toward the specific knowledge gap that motivates this protocol. A more concise introduction would improve readability while allowing greater emphasis on why previous reviews have been insufficient and why the proposed combination of systematic review, umbrella review, and policy analysis is necessary.

The methodological description is generally comprehensive, although several sections would benefit from greater precision. Please consider providing separate and more detailed descriptions of the search strategies for the umbrella review, the systematic review of primary studies, and the policy framework analysis. Because these components address different research questions and involve different evidence sources, readers would benefit from a clearer explanation of how each search will be conducted and how the corresponding eligibility criteria will differ. This would further enhance the transparency and reproducibility of the protocol.

The policy framework analysis represents one of the most innovative aspects of the protocol; however, its methodology could perhaps be described in greater detail. It would be useful to clarify which categories of policy documents will be eligible for inclusion, how grey literature searches will be standardized across countries, and how expert consultation will be documented to minimize potential selection bias. Furthermore, although AGREE II is an established instrument for evaluating clinical practice guidelines, please consider providing additional justification for its application to legislation, governmental regulations, and broader policy documents, or alternatively explain whether supplementary appraisal criteria will be used for documents that fall outside the intended scope of AGREE II.

The planned evidence synthesis is ambitious and reflects the comprehensive nature of the review.

Nevertheless, perhaps the protocol could specify more clearly the conditions under which quantitative meta-analysis will be undertaken. Considering the anticipated methodological and clinical heterogeneity across study designs, interventions, populations, and outcome measures, it appears likely that narrative synthesis will constitute the primary analytical approach. Defining minimum criteria for statistical pooling, together with identifying several priority outcome domains for quantitative synthesis and GRADE assessment, would strengthen the methodological rigor of the protocol and improve readers' expectations regarding the final review.
The inclusion of qualitative studies is an important strength because it allows the review to capture barriers, facilitators, stakeholder experiences, and implementation issues that quantitative studies alone cannot adequately address. However, please consider expanding the description of the qualitative synthesis by providing greater detail regarding the coding process, theme development, reviewer calibration, and procedures that will be used to ensure analytical credibility and reduce interpretative subjectivity. The recently added section describing the responsible use of artificial intelligence is appropriate and reflects current methodological recommendations. Nevertheless, it may be helpful to emphasize consistently throughout the manuscript that all methodological decisions will remain under direct human responsibility and that any automated tools will serve exclusively as supportive instruments.
The protocol generally follows accepted reporting standards, although some procedural descriptions appear repeatedly across several sections. For example, the explanation that two independent reviewers will conduct screening, data extraction, and quality assessment with disagreements resolved by discussion or consultation with a third reviewer is repeated multiple times. Please consider presenting this workflow once in a concise manner and referring back to it where appropriate. This would improve the overall flow of the manuscript without reducing methodological transparency.

Is the rationale for, and objectives of, the study clearly described?
Yes

Is the study design appropriate for the research question?
Yes

Are sufficient details of the methods provided to allow replication by others?
Yes

Are the datasets clearly presented in a useable and accessible format?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Physical education

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 17 Aug 2026

Simone Ciaccioni

Dear Dr Tilga,
We sincerely thank you for your positive assessment of the relevance, novelty, and methodological approach of our protocol, as well as for your detailed and constructive recommendations. Your comments helped us improve the conceptual clarity, methodological transparency, reproducibility, and readability of the manuscript. We have revised the manuscript substantially and provide our point-by-point responses below.

Comment 1. Conceptual distinction and Tier 2 eligibility
Please consider strengthening the conceptual distinction between physical education, physical activity, therapeutic exercise, rehabilitation, and play-based movement throughout the manuscript. A clearer operational definition of physical education in hospital school settings would reduce ambiguity and improve reproducibility. The authors should define the essential characteristics distinguishing educational physical education interventions from therapeutic or clinical exercise programmes and explain how borderline cases will be handled.

Response:
We agree and have strengthened these distinctions throughout the Introduction, eligibility criteria, and screening procedures. A new terminology and screening decision table, now presented as Table 1, operationally distinguishes physical education from physical activity, therapeutic exercise, rehabilitation, and active play. For inclusion in Tier 2, an intervention must have an explicit educational purpose, such as curriculum-related learning, development of movement competence, knowledge, participation, self-regulation, or personal and social learning through movement. In addition, the intervention must either:

1. be formally integrated into the hospital-school programme; or
2. involve educational staff in its planning, delivery, or assessment.

Therapeutic exercise, physiotherapy, rehabilitation, and active play delivered solely for clinical treatment, symptom management, or recreation will therefore be excluded from Tier 2. Such interventions may nevertheless be represented in Tier 1 when included in an eligible systematic review. For borderline cases combining educational, therapeutic, and recreational elements, the explicit educational purpose remains mandatory. These cases will undergo independent duplicate full-text assessment, and study authors will be contacted where the educational purpose or hospital-school connection cannot be determined from the report.

Comment 2. Introduction and knowledge gap The Introduction appropriately justifies the relevance of physical education during hospitalization, but several statements concerning the physical, psychological, educational, and social benefits of physical activity are repeated. Please consider condensing these statements and placing greater emphasis on the specific knowledge gap and the need for the combined systematic review, umbrella review, and policy analysis.

Response:
We agree and have substantially condensed and reorganised the Introduction. Repeated

descriptions of the general benefits of physical education and physical activity have been removed. The revised Introduction now focuses more directly on:

1. the limited and inconsistent provision of physical education in hospital schools;
2. the distinction between educational physical education and related clinical or recreational movement activities;
3. the fragmentation of evidence across education, rehabilitation, psychology, nursing, and sport sciences;
4. the lack of an integrated synthesis of empirical and policy evidence; and
5. the rationale for combining two evidence-synthesis tiers with a parallel policy framework analysis.

We have also added five explicit objectives addressing the characteristics and delivery of physical education interventions, their safety and outcomes, potentially transferable evidence from broader hospital-based physical activity interventions, relevant policy and regulatory provisions, and the integration of empirical and policy findings.

Comment 3. Separate search strategies Please consider providing separate and more detailed descriptions of the search strategies for the umbrella review, the systematic review of primary studies, and the policy framework analysis. Because these components address different research questions and involve different evidence sources, readers would benefit from a clearer explanation of how each search will be conducted and how the corresponding eligibility criteria will differ.

Response:
We agree and have comprehensively revised the search-methods section. Separate search structures are now presented for:

- Tier 1, the umbrella review;
- Tier 2, the systematic review of primary studies; and
- the policy framework analysis.

For Tier 1, hospital-school terminology will not be required because the aim is to identify broader systematic-review evidence concerning physical activity, exercise, and movement interventions for hospitalised children and adolescents. For Tier 2, the search will prioritise sensitivity by combining hospital-school or in-hospital education concepts with broad terms relating to physical education, physical activity, exercise, movement, sport, and active play. The educational eligibility decision rule will subsequently be applied during full-text screening. The policy search will cover official international, European, national, and regional organisation websites, ministries of education and health, legal databases, curriculum authorities, Youth Wiki, and recognised hospital-school networks. Searches will use English and relevant local-language terminology. Complete line-by-line database strategies and a detailed operational protocol for the policy framework analysis have also been added as two new extended-data files. Procedures for citation searching, grey-literature identification, search updating, translation, documentation, and reporting of search deviations are now described more explicitly.

Comment 4. Policy framework analysis
The policy framework analysis is innovative but requires more methodological detail. The

authors should clarify eligible document categories, how grey-literature searches will be standardised across countries, how expert consultation will be documented, and whether appraisal criteria other than AGREE II will be used for documents outside the scope of clinical guidelines.

Response:
We agree and have expanded the policy-analysis methods substantially. Eligible documents are now explicitly defined as binding and non-binding instruments, including:

- legislation;
- regulations;
- ministerial decrees and circulars;
- curriculum frameworks;
- national and regional strategies;
- official standards;
- implementation guidance; and
- international normative or recommendation documents.

A standardised country-search template will document the official domains searched, English and local-language terms, document categories, search dates, result counts, and reasons for exclusion. Where official website search functions are inadequate, targeted searches restricted to official domains will be used. Expert consultation will be used only to identify potentially missing documents. All experts will receive the same written request, and the search log will record their role, country, date of contact, and nominated documents. Each nominated document will be independently assessed for eligibility and source authenticity. Expert opinions themselves will not be analysed as evidence. We have also revised the appraisal strategy. AGREE II will be applied only to documents that meet the characteristics of a practice or implementation guideline. Other policy texts will be assessed using the JBI approach for textual policy evidence, while grey-literature characteristics will additionally be documented using the AACODS checklist. Laws and regulations will be characterised according to their issuing authority, legal force, currency, scope, accessibility, and implementation provisions.

Comment 5. Quantitative synthesis and priority outcomes
The planned synthesis is ambitious. Please specify more clearly the conditions under which quantitative meta-analysis will be undertaken. Narrative synthesis is likely to be the primary approach. Defining minimum criteria for pooling and priority outcome domains for quantitative synthesis and GRADE assessment would strengthen the protocol.

Response:
We agree and have revised the synthesis plan accordingly. Narrative synthesis is now explicitly identified as the primary analytical approach for both evidence-synthesis tiers. Meta-analysis will be considered only when at least three independent studies are sufficiently comparable in terms of:

- population;
- intervention purpose and content;

- study design;
- comparator;
- outcome construct; and
- assessment time point.

Pooling will not be undertaken where participant data would be double-counted, and randomised and non-randomised studies will not be combined in the same meta-analysis. Decisions to pool will be based primarily on clinical, educational, and methodological comparability rather than statistical heterogeneity alone. Case reports, case series, and descriptive evidence will be used for mapping and narrative interpretation rather than for pooled estimates of effectiveness. We have also organised the predefined priority domains into two complementary synthesis strands. Safety and feasibility/implementation, together with educational participation or engagement, will primarily contribute to an implementation/process synthesis drawing on quantitative descriptive, qualitative and mixed-method evidence. Physical functioning or motor competence and psychosocial well-being or health-related quality of life will be prioritised for comparative quantitative synthesis and GRADE assessment. However, this distinction is not absolute: safety or educational participation outcomes will also be eligible for quantitative synthesis and GRADE when sufficiently comparable comparative evidence is available. This structure is intended to keep the synthesis proportionate to the anticipated evidence base while avoiding the application of the same analytical approach to conceptually different types of evidence. Other clinical, cognitive, and academic outcomes will be mapped and synthesised narratively.

Comment 6. Qualitative synthesis and artificial intelligence
Please expand the description of the qualitative synthesis, including coding, theme development, reviewer calibration, and procedures to reduce interpretative subjectivity. The manuscript should also consistently clarify that artificial-intelligence or automated tools will be supportive only and that all methodological decisions will remain under human responsibility.

Response:
We agree and have added a more detailed qualitative synthesis procedure. Qualitative findings will be synthesised using a three-stage thematic-synthesis process comprising:

1. line-by-line coding;
2. development of descriptive themes; and
3. generation of analytical themes.

Two reviewers will independently code an initial sample representing different settings and participant perspectives. They will compare their interpretations and agree on a provisional codebook. One reviewer will then code the remaining findings, while a second reviewer will verify the coding and theme development. Analytical transparency will be supported by an audit trail documenting:

- the codebook and its revisions;
- reflexive notes;
- coding decisions;

- divergent cases; and
- changes made during theme development.

Participant quotations will also be distinguished from study-author interpretations. The section on artificial intelligence and automation has been revised to state explicitly that such tools, if used, will be limited to supportive tasks such as deduplication, record organisation, translation support, or citation prioritisation. Automated outputs will not determine study eligibility, extraction, appraisal, qualitative coding, theme development, certainty assessments, or interpretation. All outputs will be verified by human reviewers, who will retain direct responsibility for every methodological decision. The tool name, developer, version, purpose, date of use, verification procedures, and any identified errors will be documented in the final review report.

Comment 7. Repetition of reviewer procedures
The description of the two-reviewer process is repeated across several sections. Please consider presenting this workflow once and referring back to it where appropriate.

Response:
We agree and have consolidated these procedures in a new reviewer-workflow table, now presented as Table 3. The table summarises reviewer responsibilities and disagreement-resolution procedures for:

- search validation;
- title, abstract, and full-text screening;
- data extraction;
- risk-of-bias and critical appraisal;
- qualitative synthesis;
- certainty assessment; and
- policy-document analysis.

Repetitive descriptions in the individual methodological sections have consequently been shortened, and the sections now refer to the common workflow where appropriate. We again thank the reviewer for the careful and constructive assessment. The recommendations have helped us improve the conceptual precision, transparency, feasibility, and readability of the protocol.

Competing Interests: No competing interests were disclosed.

Reviewer Report 24 June 2026

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Federico Roggio
Department of Biomedical and Biotechnological Sciences, Section of Anatomy, Histology and Movement Science, School of Medicine,, University of Catania, Catania, Italy

Thank you for the opportunity to review the manuscript entitled “MSCA HOPE – Physical education in hospital schools: A protocol paper for systematic and umbrella reviews with policy framework analysis.” The manuscript addresses a timely and underexplored topic, with potential relevance for hospital education, paediatric health, and policy development. The proposed integration of a systematic review, an umbrella review, and a policy framework analysis is ambitious and valuable. The manuscript is relevant and promising, but it requires clearer methodological definitions, a more reproducible search strategy, a more cautious synthesis plan, stronger detail on the policy analysis, and a more consistent protocol-oriented tone.

Comments:

1. The scope of the review should be better defined
The manuscript includes several related concepts, such as physical education, physical activity, therapeutic exercise, active play, rehabilitation, and movement-based educational activities. However, the boundaries between these categories are not always clear. This is particularly important for Tier 2, which should focus on physical education in hospital school settings. The authors should provide a clearer operational definition of what qualifies as “physical education” in this specific context. A short terminology table or a screening decision rule would help readers understand which interventions will be included or excluded.

2. The Introduction is somewhat repetitive
The Introduction repeatedly states that physical education and physical activity have physical, psychosocial, educational, and developmental benefits. While this rationale is important, the repetition reduces the directness of the argument. The authors should condense these passages and focus more clearly on the specific gap addressed by this protocol: the lack of synthesised evidence and policy guidance on PE in hospital schools.

3. The synthesis plan should be presented more cautiously
The protocol states that meta-analyses may be conducted if sufficient homogeneous data are available. However, Tier 2 is expected to include highly heterogeneous evidence, including RCTs, non-randomised studies, observational studies, qualitative studies, mixed-methods studies, and case reports. The authors should specify more clearly under which conditions a meta-analysis will be performed. They should also identify a limited number of key outcome domains to be prioritised for synthesis and GRADE assessment. Otherwise, the synthesis plan risks appearing too ambitious for the likely evidence base.

4. Section 2.3 should be revised to avoid repetition and improve reproducibility
The section on data sources and search strategy partly repeats the information already presented in Table 1; this section should provide more operational detail.
The authors should present separate search strategies for the umbrella review, the systematic review of primary studies, and the policy framework analysis. These components have different aims and should not rely on a single generic search structure.

5. The policy framework analysis requires more detail

The policy analysis is one of the most interesting aspects of the protocol, but it is currently under-specified. The authors should clarify which types of policy documents will be eligible, and how grey literature will be searched. They should also explain how expert consultation will be documented and how potential selection bias will be minimised. In addition, the use of AGREE-II should be justified, since this tool may be appropriate for guidelines but not necessarily for laws, regulations, or ministerial documents.

6. Qualitative evidence and expert input should be handled more transparently
The inclusion of qualitative studies is appropriate, especially for exploring barriers, facilitators, feasibility, and stakeholder perspectives. However, the protocol should explain more clearly how interview-based or qualitative evidence will be analysed.
They should clarify how they will limit subjectivity in qualitative synthesis. If text-mining or AI-assisted tools are considered, these should be described as supportive tools only, with final decisions remaining under human reviewer responsibility.

7. The tone should be more consistent with a protocol paper
Although the manuscript is presented as a protocol, some sections sound closer to a guidance document or position paper. In some passages, the wording seems to anticipate the conclusions or practical impact of the future review.
The authors should revise the use of verb tenses and phrasing to distinguish more clearly between planned methods, expected outputs, and conclusions that can only be drawn after the review is completed. Expressions such as “will provide evidence” or “will support improvements” could be softened to “is intended to provide evidence” or “may inform future practice and policy”.

8. Minor aspect: repeated description of the two-reviewer process could be streamlined
The manuscript repeatedly states that two reviewers will independently perform screening, data extraction, and appraisal, with disagreements resolved by consensus or by a third reviewer. This is methodologically correct, but the repetition affects readability. The authors could summarise this workflow once, possibly in a short table, indicating the role of reviewers across screening, extraction, risk-of-bias assessment, certainty assessment, and policy document analysis.

Is the rationale for, and objectives of, the study clearly described?
Partly

Is the study design appropriate for the research question?
Yes

Are sufficient details of the methods provided to allow replication by others?
Partly

Are the datasets clearly presented in a useable and accessible format?
No

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Public health - human movement sciences

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 17 Aug 2026

Simone Ciaccioni

Dear Dr Roggio, we sincerely thank you for your careful and constructive assessment of our protocol. Your comments helped us clarify the conceptual scope of the review, strengthen the reproducibility of the methods, and adopt a more appropriately cautious protocol-oriented tone. We have substantially revised the manuscript and the associated extended data. Our point-by-point responses are provided below.

Comment 1. The scope of the review should be better defined
The manuscript includes several related concepts, such as physical education, physical activity, therapeutic exercise, active play, rehabilitation, and movement-based educational activities. However, the boundaries between these categories are not always clear. This is particularly important for Tier 2, which should focus on physical education in hospital school settings. The authors should provide a clearer operational definition of what qualifies as "physical education" in this specific context. A short terminology table or a screening decision rule would help readers understand which interventions will be included or excluded.
Response:
We agree and have substantially clarified the conceptual and operational boundaries of Tier 2. First, the Introduction now distinguishes physical education from physical activity, therapeutic exercise, rehabilitation, and active play according to their primary purpose, intended outcomes, and professional responsibilities. Second, we added a new terminology and screening decision table, now presented as Table 1. For Tier 2, an intervention must meet the following mandatory criterion:

1. It must have an explicit educational purpose, such as curriculum-related learning, development of movement competence, knowledge, participation, self-regulation, or personal and social learning through movement.

In addition, at least one of the following criteria must be met:

1. The activity is formally integrated into the hospital-school programme; or
2. Educational staff are involved in its planning, delivery, or assessment.

Therapeutic exercise, physiotherapy, rehabilitation, and active play delivered solely for clinical treatment, symptom management, or recreation are therefore excluded from Tier 2. They may nevertheless be represented in Tier 1 when included in an eligible systematic review. We have also introduced a specific decision rule for borderline interventions combining educational, therapeutic, and recreational purposes. These cases will undergo duplicate full-text assessment, and study authors will be contacted where the educational purpose or hospital-school connection remains unclear.

Comment 2. The Introduction is somewhat repetitive
The Introduction repeatedly states that physical education and physical activity have physical, psychosocial, educational, and developmental benefits. While this rationale is

important, the repetition reduces the directness of the argument. The authors should condense these passages and focus more clearly on the specific gap addressed by this protocol: the lack of synthesised evidence and policy guidance on PE in hospital schools.

Response:
We agree and have condensed and reorganised the Introduction. The revised Introduction now follows a more direct sequence:

1. the role of hospital schools and the limited provision of physical education;
2. the conceptual distinction between physical education and related movement-based activities;
3. the fragmentation of the available empirical and policy evidence; and
4. the specific objectives of the multi-component review.

Repeated descriptions of the general benefits of physical education and physical activity have been removed. The revised rationale now focuses on the absence of an integrated synthesis of empirical evidence and policy provisions concerning physical education in hospital schools. We have also added an explicit list of five objectives concerning intervention characteristics, safety and outcomes, transferable evidence from broader hospital-based physical activity interventions, policy provisions, and the integration of empirical and policy findings.

Comment 3. The synthesis plan should be presented more cautiously
The protocol states that meta-analyses may be conducted if sufficient homogeneous data are available. However, Tier 2 is expected to include highly heterogeneous evidence, including RCTs, non-randomised studies, observational studies, qualitative studies, mixed-methods studies, and case reports. The authors should specify more clearly under which conditions a meta-analysis will be performed. They should also identify a limited number of key outcome domains to be prioritised for synthesis and GRADE assessment. Otherwise, the synthesis plan risks appearing too ambitious for the likely evidence base.

Response:
We agree and have revised the synthesis plan to make narrative synthesis the primary approach. Meta-analysis will now be considered only when at least three independent studies are sufficiently comparable in relation to:

- population;
- intervention purpose and content;
- study design;
- comparator;
- outcome construct; and
- assessment time point.

Effect estimates will not be pooled when doing so would result in double-counting participants, and randomised and non-randomised studies will not be combined in the same meta-analysis. Decisions concerning pooling will be based primarily on clinical, educational, and methodological comparability rather than statistical heterogeneity alone. Case reports, case series, and descriptive evidence will be used for evidence mapping and

narrative interpretation and will not contribute to pooled estimates of effectiveness. We have also organised the predefined priority domains into two complementary synthesis strands. Safety and feasibility/implementation, together with educational participation or engagement, will primarily contribute to an implementation/process synthesis drawing on quantitative descriptive, qualitative and mixed-method evidence. Physical functioning or motor competence and psychosocial well-being or health-related quality of life will be prioritised for comparative quantitative synthesis and GRADE assessment. However, this distinction is not absolute: safety or educational participation outcomes will also be eligible for quantitative synthesis and GRADE when sufficiently comparable comparative evidence is available. This structure is intended to keep the synthesis proportionate to the anticipated evidence base while avoiding the application of the same analytical approach to conceptually different types of evidence. Other clinical, cognitive, and academic outcomes will be mapped and synthesised narratively. GRADE-CERQual will be limited to selected qualitative findings concerning safety, acceptability, barriers, facilitators, and stakeholder experiences. Certainty ratings will not be assigned to isolated case reports, descriptive mappings, or legal obligations.

Comment 4. Section 2.3 should be revised to avoid repetition and improve reproducibility
The section on data sources and search strategy partly repeats the information already presented in Table 1; this section should provide more operational detail. The authors should present separate search strategies for the umbrella review, the systematic review of primary studies, and the policy framework analysis. These components have different aims and should not rely on a single generic search structure.

Response:
We agree and have comprehensively revised Section 2.3. Separate search structures are now specified for:

- Tier 1, the umbrella review;
- Tier 2, the systematic review of primary studies; and
- the policy framework analysis.

The revised Table 2 summarises the databases, sources, and search concepts for each component. For Tier 1, hospital-school terminology is not mandatory because the purpose is to identify broader systematic-review evidence concerning physical activity, exercise, and movement interventions for hospitalised children and adolescents. For Tier 2, the search prioritises sensitivity by combining hospital-school and in-hospital education concepts with broad movement-related terminology. The educational screening decision rule in Table 1 will subsequently be applied during full-text screening. For the policy analysis, searches will cover official international, European, national, and regional websites, ministries, legal databases, curriculum authorities, Youth Wiki, and recognised hospital-school networks. Search terms will be adapted to relevant local languages. Complete line-by-line database strategies and the operational procedures for the policy analysis are now available as two new extended-data files. We have also specified procedures for citation searching, grey-literature identification, translation, search logging, deduplication, search updating, and the reporting of platforms, filters, dates, and protocol deviations.

Comment 5. The policy framework analysis requires more detail The policy analysis is one of the most interesting aspects of the protocol, but it is currently under-specified. The authors should clarify which types of policy documents will be eligible, and how grey literature will be searched. They should also explain how expert consultation will be documented and how potential selection bias will be minimised. In addition, the use of AGREE-II should be justified, since this tool may be appropriate for guidelines but not necessarily for laws, regulations, or ministerial documents.

Response:
We agree and have expanded the policy framework analysis throughout the Methods section and in a dedicated extended-data protocol. Eligible documents are now explicitly defined as binding and non-binding instruments, including:

- legislation;
- regulations;
- ministerial decrees and circulars;
- curriculum frameworks;
- national and regional strategies;
- official standards;
- implementation guidance; and
- international normative or recommendation documents.

A standardised country-level search template will record the official domains searched, English and local-language terms, document categories, search dates, result counts, and reasons for exclusion. When official website search functions are inadequate, targeted searches restricted to official domains will be used. Historical or superseded documents will be retained only when necessary to explain policy development and will be clearly identified as such. Expert consultation will be used only as a supplementary document-identification method. All experts will receive the same written request, and the search log will document their role, country, date of contact, and nominated documents. Each nominated document will undergo the same independent eligibility assessment and source-authentication procedures as documents identified through the standardised searches. Expert opinions will not be analysed as data. We have also revised the appraisal strategy. AGREE II will now be used only for documents that meet the characteristics of a practice or implementation guideline. Other policy texts will be assessed using the JBI approach for textual policy evidence, supplemented by AACODS criteria for grey-literature sources. Laws and regulations will be characterised according to issuing authority, legal force, currency, scope, accessibility, and implementation provisions. These differentiated procedures are intended to avoid applying a single appraisal instrument to fundamentally different types of policy evidence.

Comment 6. Qualitative evidence and expert input should be handled more transparently
The inclusion of qualitative studies is appropriate, especially for exploring barriers, facilitators, feasibility, and stakeholder perspectives. However, the protocol should explain more clearly how interview-based or qualitative evidence will be analysed. They should

clarify how they will limit subjectivity in qualitative synthesis. If text-mining or AI-assisted tools are considered, these should be described as supportive tools only, with final decisions remaining under human reviewer responsibility.

Response:
We agree and have added a detailed qualitative synthesis procedure. Qualitative findings will be analysed using the three-stage thematic-synthesis approach:

1. line-by-line coding;
2. development of descriptive themes; and
3. generation of analytical themes.

Two reviewers will independently code an initial sample selected to represent different settings and participant perspectives. They will compare their interpretations and agree on a provisional codebook. One reviewer will then code the remaining findings, while a second reviewer will verify the coding and development of themes. A documented audit trail will retain:

- the codebook and its revisions;
- reflexive notes;
- coding decisions;
- divergent or disconfirming cases; and
- changes made during theme development.

Participant quotations will also be distinguished from the interpretations provided by study authors. We added a separate section on artificial intelligence and automation. Any such tools, if used, will be restricted to supportive tasks such as deduplication, record organisation, translation support, or citation prioritisation. Automated outputs will not determine eligibility, extraction, appraisal, qualitative coding, theme development, certainty ratings, or interpretation. All outputs will be verified by human reviewers, who will retain responsibility for every methodological decision. The tool, version, purpose, date of use, verification procedures, and identified errors will be reported. As clarified in response to Comment 5, expert consultation will identify potentially missing policy documents only. Expert views will not be treated as qualitative evidence or included in the synthesis.

Comment 7. The tone should be more consistent with a protocol paper
Although the manuscript is presented as a protocol, some sections sound closer to a guidance document or position paper. In some passages, the wording seems to anticipate the conclusions or practical impact of the future review. The authors should revise the use of verb tenses and phrasing to distinguish more clearly between planned methods, expected outputs, and conclusions that can only be drawn after the review is completed. Expressions such as “will provide evidence” or “will support improvements” could be softened to “is intended to provide evidence” or “may inform future practice and policy”.

Response:
We agree and have revised the tone throughout the Abstract, Introduction, Discussion, conclusion, and dissemination sections. Statements that previously appeared to anticipate findings or implementation effects have been replaced with more cautious formulations.

For example, the revised manuscript states that the reviews are “intended to clarify” the evidence and policy landscape and “may inform” future stakeholder consultation, research priorities, and guideline development. The Discussion now explicitly recognises that the evidence may be sparse, heterogeneous, and at risk of bias and that the completed reviews will not, by themselves, establish universal implementation standards. It also distinguishes planned methods from possible future applications and avoids assuming that evidence from clinical physical activity interventions will be directly transferable to physical education in hospital schools.

Comment 8. Minor aspect: repeated description of the two-reviewer process could be streamlined
The manuscript repeatedly states that two reviewers will independently perform screening, data extraction, and appraisal, with disagreements resolved by consensus or by a third reviewer. This is methodologically correct, but the repetition affects readability. The authors could summarise this workflow once, possibly in a short table, indicating the role of reviewers across screening, extraction, risk-of-bias assessment, certainty assessment, and policy document analysis.

Response:
We agree and have consolidated the reviewer procedures in a new reviewer-workflow table, now presented as Table 3. The table summarises reviewer roles and disagreement-resolution procedures for:

- search validation;
- title, abstract, and full-text screening;
- data extraction;
- risk-of-bias and critical appraisal;
- qualitative synthesis;
- certainty assessment; and
- policy-document analysis.

The repeated descriptions in the individual methodological sections have consequently been shortened, with those sections now referring to the common workflow where appropriate.

Responses to the assessment questions
Is the rationale for, and objectives of, the study clearly described? Original assessment: Partly Response:
The Introduction has been condensed and refocused on the specific empirical and policy gap addressed by the protocol. The revised Abstract now states the overall aim explicitly, and the Introduction presents five clearly defined objectives covering Tier 1, Tier 2, the policy analysis, and the planned integration of findings.
Are sufficient details of the methods provided to allow replication by others? Original assessment: Partly Response:
We have added component-specific eligibility criteria, operational definitions, a Tier 2 screening decision rule, separate search frameworks, predefined synthesis thresholds, detailed qualitative procedures, policy-document selection and appraisal methods, and a

consolidated reviewer workflow. In addition, two new extended-data files provide the complete planned database search strategies and the operational protocol for the policy framework analysis. The Zenodo record has been updated accordingly.

Are the datasets clearly presented in a usable and accessible format? Original assessment: No Response:

As this article is a protocol, no empirical study dataset has yet been generated. However, the methodological extended data supporting implementation and reproducibility of the protocol are openly available through the updated Zenodo record: https://doi.org/10.5281/zenodo.21825405 The revised Data Availability statement identifies these materials and specifies that they are available under a CC0 public-domain dedication.

We again thank the reviewer for the constructive recommendations, which have materially improved the clarity, transparency, and feasibility of the protocol.

Competing Interests: No competing interests were disclosed.