



Augmented and virtual reality educational games in pediatric oncology: a scoping review protocol

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ABSTRACT

Introduction: Educational games using augmented and virtual reality may support developmentally appropriate education and psychosocial care in pediatric oncology, but the evidence is dispersed across technologies, settings, and outcomes.

Objectives: To map evidence on educational games based on augmented and/or virtual reality and their influence on the health-disease process of children and adolescents with cancer.

Methodology: This scoping review protocol follows Joanna Briggs Institute methodological guidance and the reporting guideline for scoping reviews. The primary population comprises children and adolescents with cancer aged 0-18 years inclusive; parents and caregivers may participate as secondary users or respondents when directly linked to the eligible intervention. The concept includes educational or serious games, gamification, and game-based interventions using augmented and/or virtual reality; and the context includes healthcare settings and supervised home care. Searches will be conducted in PubMed (including MEDLINE-indexed records), Embase (Embase.com, Elsevier), Scopus, Web of Science Core Collection (Clarivate), CINAHL (EBSCOhost), Cochrane Library, LILACS, the Regional Portal of the Virtual Health Library, IEEE Xplore, Google Scholar, institutional repositories, and reference lists. No language or date restrictions will be applied. Two reviewers will independently screen records, assess full texts, and chart data. Findings will be synthesized descriptively using tables and thematic maps.

Results: The review is expected to identify technologies, game characteristics, educational purposes, clinical contexts, outcomes, measurement instruments, implementation indicators, and evidence gaps.

Conclusion: The evidence map may guide the development, evaluation, and implementation of immersive educational technologies for children and adolescents with cancer.

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RESUMO

Introdução: Jogos educativos com realidade aumentada e virtual podem apoiar a educação em saúde e o cuidado psicossocial adequado ao desenvolvimento na oncologia pediátrica, mas as evidências estão dispersas entre tecnologias, contextos e desfechos.

Objetivos: Mapear as evidências sobre jogos educativos baseados em realidade aumentada e/ou virtual e sua influência no processo saúde-doença de crianças e adolescentes com câncer.

Metodologia: Este protocolo de *scoping review* segue as orientações metodológicas do Joanna Briggs Institute e a diretriz de relato para scoping reviews. A população principal compreende crianças e adolescentes com câncer dos 0 aos 18 anos, inclusive; pais e cuidadores podem participar como utilizadores secundários ou respondentes quando diretamente ligados à intervenção elegível. O conceito inclui jogos educativos ou sérios, gamificação e intervenções baseadas em jogos com realidade aumentada e/ou virtual; e o contexto inclui ambientes de cuidados de saúde e o domicílio sob cuidados supervisionados. As buscas serão realizadas em PubMed (incluindo registros indexados na MEDLINE), Embase (Embase.com, Elsevier), Scopus, Web of Science Core Collection (Clarivate), CINAHL (EBSCOhost), Cochrane Library, LILACS, Portal Regional da Biblioteca Virtual em Saúde, IEEE Xplore, Google Acadêmico, repositórios institucionais e listas de referências. Não serão aplicadas restrições de idioma ou data. Dois revisores realizarão, de forma independente, a triagem, a avaliação dos textos completos e a extração dos dados. Os achados serão sintetizados descritivamente por tabelas e mapas temáticos.

Resultados: Espera-se identificar tecnologias, características dos jogos, finalidades educativas, contextos clínicos, desfechos, instrumentos de medida, indicadores de implementação e lacunas da evidência.

Conclusão: O mapa de evidências poderá orientar o desenvolvimento, a avaliação e a implementação de tecnologias educativas imersivas para crianças e adolescentes com câncer.

Introduction

Cancer in children and adolescents frequently requires prolonged treatment, repeated hospitalizations, invasive procedures, and substantial changes to family routines. These experiences may affect sleep, schooling, social participation, and family relationships, creating persistent physical and psychosocial demands for children, adolescents, and caregivers.¹

Beyond the physical burden, pediatric cancer treatment may be experienced as traumatic. Anxiety, anticipatory fear, emotional distress, and post-traumatic stress symptoms have been reported during hospitalization, treatment, and survivorship, and clinically relevant distress may also affect parents and the wider family system.^{2,3}

Contemporary pediatric oncology therefore recognizes psychosocial care as a core component of quality care. International standards recommend systematic distress screening, age-appropriate communication, assessment, and continuous support for children and families throughout treatment and follow-up.⁴ Nevertheless, implementation remains inconsistent across institutions, and gaps persist between recommended standards and routine practice.⁵

Educational approaches are also central to children's participation in care. Strategies that are insufficiently responsive to developmental level may limit understanding, preparedness, and emotional regulation. Structured therapeutic play has been associated with lower fear and anxiety and greater satisfaction among children receiving chemotherapy and their caregivers, supporting the value of developmentally appropriate interventions.⁶

Serious games and gamification may extend these approaches by combining active learning, motivation, feedback, and meaningful participation. A recent scoping review of serious games for cancer control among children and adolescents found a growing but heterogeneous body of evidence, with substantial variation in intervention goals, study designs, and outcomes.⁷

Extended-reality technologies, including augmented and virtual reality, add immersion, simulation, interactivity, and real-time feedback. Evidence in pediatric healthcare suggests potential benefits for procedural pain, anxiety, cooperation, knowledge acquisition, and satisfaction, although methodological limitations and variation in outcome measurement remain.⁸ In pediatric oncology specifically, systematic reviews and meta-analyses indicate that virtual reality may reduce pain, anxiety, and fear, but the evidence is still limited by small samples and heterogeneous interventions.^{9,10}

Educational exposure through immersive virtual reality may also improve procedural understanding. In a study preparing children for radiation therapy, virtual simulation improved health literacy and reduced pre-procedural anxiety among children and parents, while demonstrating high acceptability.¹¹ However, it remains unclear how specifically educational games using augmented and/or virtual reality are designed, implemented, and associated with

knowledge, health literacy, coping, emotional outcomes, hospital experience, acceptability, usability, and satisfaction in pediatric oncology.

A preliminary search of the Joanna Briggs Institute Evidence Synthesis journal, the Cochrane Database of Systematic Reviews, PROSPERO, and PubMed identified reviews on serious games, technology-based interventions, and augmented or virtual reality in pediatric care and oncology. These reviews do not fully address the specific intersection of educational game components, immersive technology, pediatric cancer, and the broader health-disease process. Therefore, a dedicated scoping review is warranted.

The objective of this review is to map and describe the available evidence on educational games based on augmented and/or virtual reality used with children and adolescents with cancer. The review will emphasize: (1) knowledge and health literacy, including understanding of treatment, self-care, and preparation for procedures; (2) emotional and symptom-related outcomes, including anxiety, fear, stress, distress, pain, and potential traumatic effects of hospitalization; and (3) the experience of children, adolescents, and families, including acceptability, usability, and satisfaction.

The review question is: *What evidence is available on educational games based on augmented and/or virtual reality and their influence on the health-disease process of children and adolescents with cancer?*

Methodology

Study design and registration

This protocol describes a scoping review to be conducted in accordance with updated Joanna Briggs Institute methodological guidance and reported using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews.^{12,13} The review will proceed through the sequential stages of defining the question and eligibility criteria, identifying evidence, selecting sources, charting data, synthesizing findings, and presenting the evidence map.

The protocol has been prospectively registered in the Open Science Framework. Registration details are supplied in the separate title page and submission metadata to preserve blinded peer review. Any substantive protocol amendments will be dated, justified, and reported in the final review.

Eligibility criteria

Eligibility will be defined using the Population-Concept-Context framework (Table 1). Children and adolescents with cancer from birth through 18 years of age, inclusive (i.e., <19 years), will be eligible during treatment, follow-up, or survivorship when the intervention is linked to healthcare. Parents and caregivers may be included as secondary participants, co-users, or respondents when their involvement is directly linked to an eligible intervention delivered to or used with the child or adolescent; caregiver

outcomes, such as anxiety, satisfaction, and family experience, will be charted as secondary outcomes. Studies involving only parents or caregivers without participation or exposure of an eligible child or adolescent with cancer to the intervention will be excluded. Studies with mixed populations will be included only when data for the eligible pediatric oncology subgroup can be extracted separately.

For the purposes of this review, augmented reality (AR) will be defined as technology that overlays digital content onto the user's view of the physical environment, whereas virtual reality (VR) will refer to a computer-generated environment that replaces or substantially immerses the user's visual field. Mixed reality and extended reality will be eligible only when the intervention includes an AR or VR component. A game-based intervention must include identifiable game elements or mechanics, such as goals, rules, challenges, feedback, scoring, levels, narrative, or rewards. Serious games are games designed primarily for a purpose beyond entertainment, whereas gamification refers to the use of game elements in a non-game health-related activity. Educational intent will mean an explicit aim to improve knowledge, health literacy, treatment understanding, procedural preparation, self-care or self-management, coping, or participation in care. The health-disease process will be operationalized through the educational, emotional, symptom-related, experiential, and implementation outcomes defined in this protocol.

The concept includes educational games, serious games, gamification, and game-based interventions that use augmented reality, virtual reality, mixed reality, or extended reality and have an explicit educational, preparatory, self-management, coping, or treatment-understanding purpose. At least one health-related outcome must be reported, such as knowledge, health literacy, procedural preparedness, adherence, coping, anxiety, fear, stress, distress, pain, patient or family experience, acceptability, usability, satisfaction, or adverse effects.

Primary quantitative, qualitative, and mixed-method studies will be eligible, including randomized and non-randomized trials, quasi-experimental studies, cohort studies, cross-sectional studies, qualitative studies, and feasibility or usability studies. Relevant theses, dissertations, technical reports, and intervention protocols may be included as grey literature. Secondary reviews will be charted separately to contextualize the field and identify additional primary studies; their findings will not be combined with primary evidence.

Interventions or studies will be excluded if any of the following independent criteria apply: (1) augmented, virtual, mixed, or extended reality is used only passively, without meaningful user interaction; (2) no identifiable game component or game mechanic is present; (3) there is no explicit educational, preparatory, self-management, coping, or treatment-understanding intent; (4) the game does not use augmented or virtual reality, or mixed/extended reality containing an AR/VR component; (5) the setting is exclusively educational and unrelated to healthcare; or (6) the report is exclusively technical, such as hardware calibration, without evaluation involving eligible patients or secondary users.

Table 1. Population-Concept-Context eligibility framework.

Element	Operational definition
Population	Children and adolescents with cancer from birth through 18 years of age, inclusive (<19 years), during treatment, follow-up, or survivorship in a healthcare-related context. Parents/caregivers may be secondary participants, co-users, or respondents when directly linked to the eligible pediatric intervention; caregiver-only interventions are excluded.
Concept	Educational games, serious games, gamification, or game-based interventions using augmented and/or virtual reality (including mixed/extended reality when an AR/VR component is present) for health education, procedural preparation, coping or self-regulation, self-care/self-management, or treatment understanding, with at least one health-related outcome.
Context	Healthcare settings, including hospitals, outpatient clinics, day hospitals, infusion centers, radiotherapy departments, and supervised home-care settings when the intervention is linked to the patient's cancer care.

Information sources and search strategy

The search will follow a three-step approach. First, a preliminary search in PubMed (including MEDLINE-indexed records), CINAHL (EBSCOhost), and the Regional Portal of the Virtual Health Library will be used to identify text words and controlled vocabulary in titles, abstracts, and indexing terms. Vocabulary will be examined in Medical Subject Headings, Health Sciences Descriptors, Emtree, and CINAHL Headings, as applicable.

Second, comprehensive searches will be conducted in PubMed (including MEDLINE-indexed records), Embase (Embase.com, Elsevier), Scopus, Web of Science Core Collection (Clarivate), CINAHL (EBSCOhost), Cochrane Library, LILACS, the Regional Portal of the Virtual Health Library, IEEE Xplore, and Google Scholar. Controlled vocabulary and free-text terms in English, Portuguese, and Spanish will be adapted to each database and platform. Boolean operators and truncation will be used as supported by each platform. No language or date restrictions will be applied. The strategy will be reviewed by an institutional librarian before the final searches are run.

Third, grey literature will be sought in Google Scholar and institutional repositories, including repositories of Portuguese universities. Reference lists of included studies and relevant reviews will be screened manually, and complementary citation searching will be undertaken when appropriate. Searches will be rerun before the final synthesis, and the date, platform, strategy, and number of records retrieved will be documented. Table 2 summarizes the pilot searches; complete strategies are provided in Supplementary File 1.

Table 2. Information sources and pilot search yields.

Information source	Search field /syntax	Pilot records
PubMed	All Fields	33
Embase (Embase.com, Elsevier)	All searchable fields	72
Scopus	ALL	6,377
Web of Science Core Collection (Clarivate)	ALL	49
CINAHL (EBSCOhost)	TX	4,451
Cochrane Library	All Text	23
LILACS	All searchable fields	8
Regional Portal of the Virtual Health Library	All searchable fields	28
IEEE Xplore	Full Text & Metadata	691
Google Scholar	Full text	718

Evidence selection

All identified records will be exported to Rayyan for duplicate management and screening.¹⁴ Two reviewers will independently screen titles and abstracts while blinded to each other's decisions. Before formal screening, both reviewers will pilot the eligibility criteria on 25 records. Disagreements will be discussed, and the criteria will be clarified until at least 75% agreement is reached.

Potentially eligible reports will then be assessed in full text by two reviewers independently. Reasons for full-text exclusion will be recorded. Disagreements at any stage will be resolved through discussion or consultation with a third reviewer. The selection process will be presented in a scoping-review flow diagram.

Data charting

Two reviewers will independently chart data using a standardized Microsoft Excel form. The form will be piloted on a small sample of included studies and refined when necessary. Any modifications will be documented in the final review. Disagreements will be resolved by consensus or by a third reviewer.

The charting framework will capture bibliographic and methodological characteristics, participant characteristics, clinical context, technology and game features, educational content, outcomes, measurement instruments, implementation indicators, and principal findings (Table 3). Authors of included reports may be contacted when essential information is missing or unclear.

Data synthesis and presentation

Study characteristics and findings will be summarized descriptively in direct alignment with the review question and objectives. Numerical data will be reported using frequencies, proportions, ranges, and other appropriate descriptive summaries. Qualitative and mixed findings will be organized into thematic categories.

Tables, charts, diagrams, and evidence maps may be used to show relationships among technologies, game characteristics, educational purposes, healthcare contexts,

participant groups, outcomes, instruments, and implementation findings. No meta-analysis or formal certainty assessment is planned because the objective is to map the extent, characteristics, and gaps of the evidence.

Table 3. Data-charting framework.

Domain	Variables
Study identification	First author, year, title, country, publication type, source/database.
Methods and participants	Study design, sample size, age, cancer diagnosis, treatment or survivorship status, and caregiver role/relationship when applicable.
Context and intervention	Healthcare setting, technology, level of immersion, device, game type and mechanics, duration, frequency, facilitator, educational content.
Outcomes and measurement	Knowledge or health literacy, preparedness, adherence, coping, anxiety, fear, stress, distress, pain, patient or family experience, caregiver anxiety, instruments, and assessment time points.
Implementation and findings	Acceptability, usability, satisfaction, adverse effects, feasibility, principal results, limitations, and reviewer notes.

Ethical considerations

This study will synthesize publicly available literature and will not involve direct contact with human participants or access to identifiable individual data. Research ethics committee approval and informed consent are therefore not applicable.

Expected Results

The review is expected to identify the types of augmented- and virtual-reality educational games used in pediatric oncology, their intended users, clinical contexts, educational objectives, game mechanics, and modes of delivery. It will also map the outcomes and instruments used to evaluate knowledge, health literacy, preparedness, coping, emotional distress, pain, experience, acceptability, usability, satisfaction, and safety.

The resulting evidence map will distinguish areas with a greater concentration of studies from areas in which research is sparse or absent. This mapping will describe the volume and characteristics of the available research and will not be interpreted as an assessment of evidence strength, certainty, robustness, or risk of bias. It will also identify methodological gaps related to study design, sample size, age groups, cancer diagnoses, follow-up duration, accessibility, implementation, and reporting of intervention components.

Discussion

This protocol addresses a focused intersection that is not adequately captured by broader reviews of serious games, digital health, or immersive distraction. By requiring both a game-based component and augmented and/or virtual reality, the review will clarify whether immersive technologies are being used only to distract children from

procedures or also to support understanding, preparation, self-management, coping, and participation in care.

The review will be relevant to clinicians, researchers, designers, families, and healthcare organizations developing child-centered technologies. Mapping the relationship between educational content, game mechanics, clinical context, and measured outcomes may support more transparent intervention design and more consistent evaluation. The inclusion of acceptability, usability, satisfaction, and adverse effects is intended to ensure that implementation considerations are examined alongside clinical and educational outcomes.

Expected limitations include heterogeneity in terminology, technology maturity, intervention components, and outcome measures. Broad database searches may retrieve many irrelevant records, while unpublished projects may remain difficult to identify. Because scoping reviews map evidence rather than estimate pooled effects, the final review will not determine comparative effectiveness. These limitations will be addressed through transparent eligibility criteria, duplicate independent screening, comprehensive search documentation, and separate charting of primary and secondary evidence.

Conclusion

This scoping review will map how educational games based on augmented and/or virtual reality have been used with children and adolescents with cancer and how they relate to educational, emotional, symptom-related, experiential, and implementation outcomes. The findings may guide future technology development, clinical evaluation, research priorities, and implementation of developmentally appropriate educational resources in pediatric oncology.

Data availability statement

The protocol registration details and complete search strategies are supplied with the submission. Data generated during the review will be made available in the registered repository or from the corresponding author on reasonable request.

References

- Nunes IM, Duarte MLC, Silva DG, D'Ávila AP, Pavani FM, Trindade KR. The routine and mental health of hospitalized children with cancer: family perspectives. *Rev Gaucha Enferm.* 2024;45:e20230238. doi:10.1590/1983-1447.2024.20230238.en
- Low CE, Tan SYP, Loh A, Yu J, Ong JZE, Loh CYL, et al. Post-traumatic stress disorder and symptoms in paediatric cancer survivors and their family nucleus: systematic review, meta-analysis and meta-regression. *BJPsych Open.* 2024;10(6):e207. doi:10.1192/bjo.2024.805
- Peng Y, Xu L, Gu C, Ma G, Zhang Z, Zhang Y, et al. Prevalence and associated factors of post-traumatic stress symptoms in hospitalised children with cancer and their parents in South China: a multicentred cross-sectional study. *Asia Pac J Oncol Nurs.* 2024;11(10):100568. doi:10.1016/j.apjon.2024.100568
- Wiener L, Kazak AE, Noll RB, Patenaude AF, Kupst MJ. Standards for the psychosocial care of children with cancer and their families: an introduction to the special issue. *Pediatr Blood Cancer.* 2015;62(suppl 5):S419-S424. doi:10.1002/pbc.25675
- Jones B, Currin-McCulloch J, Pelletier W, Sardi-Brown V, Brown P, Wiener L. Psychosocial standards of care for children with cancer and their families: a national survey of pediatric oncology social workers. *Soc Work Health Care.* 2018;57(4):221-249. doi:10.1080/00981389.2018.1441212
- Hüzmeli H, Semerci R, Kebudi R. The effect of therapeutic play on fear, anxiety, and satisfaction levels of pediatric oncology patients receiving chemotherapy. *J Pediatr Nurs.* 2024;77:e195-e201. doi:10.1016/j.pedn.2024.04.029
- Kim S, Wilson P, Abraham O. Investigating the use of serious games for cancer control among children and adolescents: scoping review. *JMIR Serious Games.* 2024;12:e58724. doi:10.2196/58724
- Savaş EH, Coşkun AB, Elmaoğlu E, Semerci R, Şahiner NC. Investigating the effects of augmented reality-based interventions on pediatric patient outcomes in the clinical setting: a systematic review. *J Pediatr Nurs.* 2025;85:39-47. doi:10.1016/j.pedn.2025.07.014
- Cheng Z, Yu S, Zhang W, Liu X, Shen Y, Weng H. Virtual reality for pain and anxiety of pediatric oncology patients: a systematic review and meta-analysis. *Asia Pac J Oncol Nurs.* 2022;9(12):100152. doi:10.1016/j.apjon.2022.100152
- Comparcini D, Simonetti V, Galli F, et al. Immersive and non-immersive virtual reality for pain and anxiety management in pediatric patients with hematological or solid cancer: a systematic review. *Cancers (Basel).* 2023;15(3):985. doi:10.3390/cancers15030985
- Tennant M, Anderson N, Youssef GJ, et al. Effects of immersive virtual reality exposure in preparing pediatric oncology patients for radiation therapy. *Tech Innov Patient Support Radiat Oncol.* 2021;19:18-25. doi:10.1016/j.tipsro.2021.06.001
- Peters MDJ, Marnie C, Tricco AC, et al. Updated methodological guidance for the conduct of scoping reviews. *JBIEvid Synth.* 2020;18(10):2119-2126. doi:10.11124/JBIES-20-00167
- Tricco AC, Lillie E, Zarin W, et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med.* 2018;169(7):467-473. doi:10.7326/M18-0850
- Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan-a web and mobile app for systematic reviews. *Syst Rev.* 2016;5:210. doi:10.1186/s13643-016-0384-4

Supplementary File 1. Complete Search Strategies

The strategies below reproduce the pilot searches supplied in the protocol. Search dates and final yields should be updated when the definitive searches are conducted. No language or date limits are planned.

1. PubMed | Pilot records: 33

((("augmented reality"[All Fields] OR "virtual reality"[All Fields] OR "mixed reality"[All Fields] OR "extended reality"[All Fields] OR XR[All Fields] OR "immersive technology"[All Fields] OR "immersive technologies"[All Fields] OR "immersive virtual reality"[All Fields] OR "virtual environment"[All Fields] OR "virtual environments"[All Fields])) AND (("serious game"[All Fields] OR "serious games"[All Fields] OR "educational game"[All Fields] OR "educational games"[All Fields] OR "video game"[All Fields] OR "video games"[All Fields] OR videogame[All Fields] OR "digital game"[All Fields] OR "digital games"[All Fields] OR "computer game"[All Fields] OR "computer games"[All Fields] OR "mobile game"[All Fields] OR "mobile games"[All Fields] OR gamif*[All Fields] OR "game-based"[All Fields] OR "game based"[All Fields] OR gameplay[All Fields] OR exergam*[All Fields] OR "active video game"[All Fields] OR "active video games"[All Fields] OR "interactive game"[All Fields] OR "interactive games"[All Fields]))) AND ((cancer*[All Fields] OR neoplasm*[All Fields] OR oncolog*[All Fields] OR tumor*[All Fields] OR tumour*[All Fields] OR malignan*[All Fields] OR leukemia[All Fields] OR leukaemia[All Fields] OR lymphoma[All Fields] OR sarcoma[All Fields] OR "brain tumor"[All Fields] OR "brain tumors"[All Fields] OR "brain tumour"[All Fields] OR "brain tumours"[All Fields] OR "solid tumor"[All Fields] OR "solid tumors"[All Fields] OR "solid tumour"[All Fields] OR "solid tumours"[All Fields] OR "hematologic malignancy"[All Fields] OR "hematologic malignancies"[All Fields] OR "haematologic malignancy"[All Fields] OR "haematologic malignancies"[All Fields] OR "hemato-oncology"[All Fields] OR "haemato-oncology"[All Fields] OR "pediatric oncology"[All Fields] OR "paediatric oncology"[All Fields]))) AND ((child*[All Fields] OR adolescen*[All Fields] OR pediatric*[All Fields] OR paediatric*[All Fields] OR teen*[All Fields] OR teens[All Fields] OR youth*[All Fields] OR "young people"[All Fields] OR "young person"[All Fields] OR "young persons"[All Fields] OR infant*[All Fields] OR preschool*[All Fields] OR "school age"[All Fields] OR "school-aged"[All Fields]))

2. Embase | Pilot records: 72

('augmented reality' OR 'virtual reality' OR 'mixed reality' OR 'extended reality' OR xr OR 'immersive technology' OR 'immersive technologies' OR 'immersive virtual reality' OR 'virtual environment' OR 'virtual environments') AND ('serious game' OR 'serious games' OR 'educational game' OR 'educational games' OR 'video game' OR 'video games' OR videogame* OR 'digital game' OR 'digital games' OR 'computer game' OR 'computer games' OR 'mobile game' OR 'mobile games' OR gamif* OR 'game-based' OR 'game based' OR gameplay OR exergam* OR 'active video game' OR 'active video games' OR 'interactive game' OR 'interactive games') AND (cancer* OR neoplasm* OR oncolog* OR tumor* OR tumour* OR malignan* OR leukemia OR leukaemia OR lymphoma OR sarcoma OR 'brain tumor' OR 'brain tumors' OR 'brain tumour' OR 'brain tumours' OR 'solid tumour' OR 'solid tumors' OR 'solid tumour' OR 'solid tumours' OR 'hematologic malignancy' OR 'hematologic malignancies' OR 'haematologic malignancy' OR 'haematologic malignancies' OR 'hemato-oncology' OR 'haemato-oncology' OR 'pediatric oncology' OR 'paediatric oncology') AND (child* OR adolescen* OR pediatric* OR paediatric* OR teen* OR teens OR youth* OR 'young people' OR 'young person' OR 'young persons' OR infant* OR preschool* OR 'school age' OR 'school-aged')

3. Scopus | Pilot records: 6,377

ALL(("augmented reality" OR "virtual reality" OR "mixed reality" OR "extended reality" OR XR OR "immersive technology" OR "immersive technologies" OR "immersive virtual reality" OR "virtual environment" OR "virtual environments") AND ("serious game" OR "serious games" OR "educational game" OR "educational games" OR "video game" OR "video games" OR videogame* OR "digital game" OR "digital games" OR "computer game" OR "computer games" OR "mobile game" OR "mobile games" OR gamif* OR "game-based" OR "game based" OR gameplay OR exergam* OR "active video game" OR "active video games" OR "interactive game" OR "interactive games") AND (cancer* OR neoplasm* OR oncolog* OR tumor* OR tumour* OR malignan* OR leukemia OR leukaemia OR lymphoma OR sarcoma OR "brain tumor" OR "brain tumors" OR "brain tumour" OR "brain tumours" OR "solid tumor" OR "solid tumors" OR "solid tumour" OR "solid tumours" OR "hematologic malignancy" OR "hematologic malignancies" OR "haematologic malignancy" OR "haematologic malignancies" OR "hemato-oncology" OR "haemato-oncology" OR "pediatric oncology" OR "paediatric oncology") AND (child* OR adolescen* OR pediatric* OR paediatric* OR teen* OR teens OR youth* OR "young people" OR "young person" OR "young persons" OR infant* OR preschool* OR "school age" OR "school-aged"))

4. Web of Science | Pilot records: 49

ALL=(("augmented reality" OR "virtual reality" OR "mixed reality" OR "extended reality" OR XR OR "immersive technology" OR "immersive technologies" OR "immersive virtual reality" OR "virtual environment" OR "virtual environments") AND ("serious game" OR "serious games" OR "educational game" OR "educational games" OR "video game" OR "video games" OR videogame* OR "digital game" OR "digital games" OR "computer game" OR "computer games" OR "mobile game" OR "mobile games" OR gamif* OR "game-based" OR "game based" OR gameplay OR exergam* OR "active video game" OR "active video games" OR "interactive game" OR "interactive games") AND (cancer* OR neoplasm* OR oncolog* OR tumor* OR tumour* OR malignan* OR leukemia OR leukaemia OR lymphoma OR sarcoma OR "brain tumor" OR "brain tumors" OR "brain tumour" OR "brain tumours" OR "solid tumor" OR "solid tumors" OR "solid tumour" OR "solid tumours" OR "hematologic malignancy" OR "hematologic malignancies" OR "haematologic malignancy" OR "haematologic malignancies" OR "hemato-oncology" OR "haemato-oncology" OR "pediatric oncology" OR "paediatric oncology") AND (child* OR adolescen* OR pediatric* OR paediatric* OR teen* OR teens OR youth* OR "young people" OR "young person" OR "young persons" OR infant* OR preschool* OR "school age" OR "school-aged"))

5. CINAHL | Pilot records: 4,451

((TX "augmented reality" OR TX "virtual reality" OR TX "mixed reality" OR TX "extended reality" OR TX XR OR TX "immersive technology" OR TX "immersive technologies" OR TX "immersive virtual reality" OR TX "virtual environment" OR TX "virtual environments")) AND ((TX "serious game" OR TX "serious games" OR TX "educational game" OR TX "educational games" OR TX "video game" OR TX "video games" OR TX videogame* OR TX "digital game" OR TX "digital games" OR TX "computer game" OR TX "computer games" OR TX "mobile game" OR TX "mobile games" OR TX gamif* OR TX "game-based" OR TX "game based" OR TX gameplay OR TX exergam* OR TX "active video game" OR TX "active video games" OR TX "interactive game" OR TX "interactive games")) AND ((TX cancer* OR TX neoplasm* OR TX oncolog* OR TX tumor* OR TX tumour* OR TX malignan* OR TX leukemia OR TX leukaemia OR TX lymphoma OR TX sarcoma OR TX "brain tumor" OR TX "brain tumors" OR TX "brain tumour" OR TX "brain tumours" OR TX "solid tumor" OR TX "solid tumors" OR TX "solid tumour" OR TX "solid tumours" OR TX "hematologic malignancy" OR TX "hematologic malignancies" OR TX "haematologic malignancy" OR TX "haematologic malignancies" OR TX "hemato-oncology" OR TX "haemato-oncology" OR TX "pediatric oncology" OR TX "paediatric oncology")) AND ((TX child* OR TX adolescen* OR TX pediatric* OR TX paediatric* OR TX teen* OR TX teens OR TX youth* OR TX "young people" OR TX "young person" OR TX "young persons" OR TX infant* OR TX preschool* OR TX "school age" OR TX "school-aged"))

6. Cochrane Library | Pilot records: 23

("augmented reality" OR "virtual reality" OR "mixed reality" OR "extended reality" OR XR OR "immersive technology" OR "immersive technologies" OR "immersive virtual reality" OR "virtual environment" OR "virtual environments") AND ("serious game" OR "serious games" OR "educational game" OR "educational games" OR "video game" OR "video games" OR videogame OR "digital game" OR "digital games" OR "computer game" OR "computer games" OR "mobile game" OR "mobile games" OR gamif* OR "game-based" OR "game based" OR gameplay OR exergam* OR "active video game" OR "active video games" OR "interactive game" OR "interactive games") AND (cancer* OR neoplasm* OR oncolog* OR tumor* OR tumour* OR malignan* OR leukemia OR leukaemia OR lymphoma OR sarcoma OR "brain tumor" OR "brain tumors" OR "brain tumour" OR "brain tumours" OR "solid tumor" OR "solid tumors" OR "solid tumour" OR "solid tumours" OR "pediatric oncology" OR "paediatric oncology" OR "hemato-oncology" OR "haemato-oncology") AND (child* OR adolescen* OR pediatric* OR paediatric* OR teen* OR teens OR youth* OR "young people" OR "young person" OR "young persons" OR infant* OR preschool* OR "school age" OR "school-aged") in All Text - (Word variations have been searched)

7. LILACS | Pilot records: 8

(("realidade virtual" OR "realidade aumentada" OR "realidade mista" OR "realidade estendida" OR "virtual reality" OR "augmented reality" OR "mixed reality" OR "extended reality" OR XR OR "realidad virtual" OR "realidad aumentada" OR "realidad mixta" OR "realidad extendida")) AND (("jogo sério" OR "jogos sérios" OR "jogo educativo" OR "jogos educativos" OR videogame OR videogames OR "jogo digital" OR "jogos digitais" OR gamificação OR exergame OR exergames OR "serious game" OR "serious games" OR "educational game" OR "educational games" OR "video game" OR "video games" OR "digital game" OR "digital games" OR gamification OR "game-based" OR "game based" OR "juego serio" OR "juegos serios" OR "juego educativo" OR "juegos educativos" OR videojuego OR videojuegos OR gamificación)) AND ((câncer OR cancro OR neoplasia OR neoplasias OR oncologia OR leucemia OR linfoma OR tumor OR tumores OR malignidade OR cancer OR neoplasm OR neoplasms OR oncology OR leukemia OR leukaemia OR lymphoma OR tumor OR tumors OR tumour OR tumours OR malignancy OR malignancies OR câncer OR oncología)) AND ((criança OR crianças OR adolescente OR adolescentes OR pediatria OR pediátrico OR pediátrica OR infantojuvenil OR infantil OR child OR children OR adolescent OR adolescents OR pediatric OR paediatric OR teen OR teens OR youth OR "young people" OR niño OR niños OR pediatria))

8. Regional Portal of the Virtual Health Library | Pilot records: 28

(("realidade virtual" OR "realidade aumentada" OR "realidade mista" OR "realidade estendida" OR "virtual reality" OR "augmented reality" OR "mixed reality" OR "extended reality" OR XR OR "realidad virtual" OR "realidad aumentada" OR "realidad mixta" OR "realidad extendida")) AND (("jogo sério" OR "jogos sérios" OR "jogo educativo" OR "jogos educativos" OR videogame OR videogames OR "jogo digital" OR "jogos digitais" OR gamificação OR exergame OR exergames OR "serious game" OR "serious games" OR "educational game" OR "educational games" OR "video game" OR "video games" OR "digital game" OR "digital games" OR gamification OR "game-based" OR "game based" OR "juego serio" OR "juegos serios" OR "juego educativo" OR "juegos educativos" OR videojuego OR videojuegos OR gamificación)) AND ((câncer OR cancro OR neoplasia OR neoplasias OR oncologia OR leucemia OR linfoma OR tumor OR tumores OR malignidade OR cancer OR neoplasm OR neoplasms OR oncology OR leukemia OR leukaemia OR lymphoma OR tumor OR tumors OR tumour OR tumours OR malignancy OR malignancies OR câncer OR oncología)) AND ((criança OR crianças OR adolescente OR adolescentes OR pediatria OR pediátrico OR pediátrica OR infantojuvenil OR infantil OR child OR children OR adolescent OR adolescents OR pediatric OR paediatric OR teen OR teens OR youth OR "young people" OR niño OR niños OR pediatria))

9. IEEE Xplore | Pilot records: 691

("Full Text & Metadata": "augmented reality" OR "Full Text & Metadata": "virtual reality" OR "Full Text & Metadata": "mixed reality" OR "Full Text & Metadata": "extended reality" OR "Full Text & Metadata": "XR" OR "Full Text & Metadata": "immersive technology" OR "Full Text & Metadata": "immersive technologies" OR "Full Text & Metadata": "immersive virtual reality" OR "Full Text & Metadata": "virtual environment" OR "Full Text & Metadata": "virtual environments") AND ("Full Text & Metadata": "serious game" OR "Full Text & Metadata": "serious games" OR "Full Text & Metadata": "educational game" OR "Full Text & Metadata": "educational games" OR "Full Text & Metadata": "video game" OR "Full Text & Metadata": "video games" OR "Full Text & Metadata": "videogame" OR "Full Text & Metadata": "videogames" OR "Full Text & Metadata": "digital game" OR "Full Text & Metadata": "digital games" OR "Full Text & Metadata": "computer game" OR "Full Text & Metadata": "computer games" OR "Full Text & Metadata": "mobile game" OR "Full Text & Metadata": "mobile games" OR "Full Text & Metadata": "gamification" OR "Full Text & Metadata": "game-based" OR "Full Text & Metadata": "game based" OR "Full Text & Metadata": "gameplay" OR "Full Text & Metadata": "exergame" OR "Full Text & Metadata": "exergames" OR "Full Text & Metadata": "active video game" OR "Full Text & Metadata": "active video games" OR "Full Text & Metadata": "interactive game" OR "Full Text & Metadata": "interactive games") AND ("Full Text & Metadata": "cancer" OR "Full Text & Metadata": "neoplasm" OR "Full Text & Metadata": "neoplasms" OR "Full Text & Metadata": "oncology" OR "Full Text & Metadata": "tumor" OR "Full Text & Metadata": "tumors" OR "Full Text & Metadata": "tumour" OR "Full Text & Metadata": "tumours" OR "Full Text & Metadata": "leukemia" OR "Full Text & Metadata": "leukaemia" OR "Full Text & Metadata": "lymphoma" OR "Full Text & Metadata": "sarcoma" OR "Full Text & Metadata": "pediatric oncology" OR "Full Text & Metadata": "paediatric oncology") AND ("Full Text & Metadata": "child" OR "Full Text & Metadata": "children" OR "Full Text & Metadata": "adolescent" OR "Full Text & Metadata": "adolescents" OR "Full Text & Metadata": "pediatric" OR "Full Text & Metadata": "paediatric" OR "Full Text & Metadata": "teen" OR "Full Text & Metadata": "teens" OR "Full Text & Metadata": "youth" OR "Full Text & Metadata": "young people")

10. Google Scholar | Pilot records: 718

(realidade aumentada OR realidade virtual OR realidade mista OR realidade estendida) AND (jogo OR jogos sérios OR gamifica) AND (câncer OR oncologia OR leucemia OR linfoma) AND (criança OR adolescente OR pediatria)