

XR-Based Bullying Prevention Interventions Among K–12 Students: A Scoping Review of Design, Theory, and Outcomes

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Li, XY; Wang, Z; Li, LL; Luo, H.

Corresponding author:

xiayu li

lixiaxu@mails.ccnu.edu.cn

Author Affiliation:

Central China Normal University.

ADMINISTRATIVE INFORMATION**Support** - Self.**Review Stage at time of this submission** - Completed but not published.**Conflicts of interest** - None declared.**INPLASY registration number:** INPLASY202680060**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 15 August 2026 and was last updated on 15 August 2026.**INTRODUCTION**

Review question / Objective (RQ1) What are the study, technology, and intervention-design characteristics of XR-based bullying prevention interventions among K–12 students? (RQ2) How have theoretical mechanisms, XR affordances, and learning activities been aligned? (RQ3) What outcomes have been reported, and what evidence patterns and gaps are apparent?

Rationale Bullying remains a prevalent problem among children and adolescents and can have persistent psychological and social consequences. Extended reality (XR) technologies offer new possibilities for bullying prevention by providing controlled and repeatable scenarios, supporting perspective and role changes, and allowing learners to practice responses that may be difficult to reproduce safely in face-to-face settings. However, the existing literature is heterogeneous in technological configuration, intervention purpose, theoretical basis, instructional design, and outcome measurement. Previous reviews have

examined XR applications for bullying, technology-supported anti-bullying interventions, bystander behavior, or the overall effectiveness of VR-based interventions, but have not primarily examined how theoretical mechanisms, XR affordances, learning activities, and outcomes are aligned within K–12 prevention designs. A scoping review is therefore needed to map this emerging evidence base, clarify how XR is being used within bullying prevention, identify recurring design patterns, and highlight gaps in the evidence linking immersive experiences to meaningful and sustained intervention outcomes.

Condition being studied The condition of interest is bullying among K–12 students. Bullying is characterized by intentional and repeated harm within peer relationships involving a power imbalance and may take physical, verbal, relational, or technology-mediated forms. Related phenomena such as cyberbullying, peer victimization, social exclusion, relational aggression, and peer sexual harassment are included when explicitly addressed within a

bullying-prevention context. Bullying can involve victims, perpetrators, bystanders, defenders, and other peer roles and is associated with important psychological and social consequences during childhood and adolescence.

METHODS

Search strategy A systematic search was conducted on March 13, 2026 in Web of Science, Scopus, ERIC, and PsycINFO. Coverage was limited to publications dated January 1, 2005 through December 31, 2025. The search combined terms for bullying-related phenomena with terms for XR technologies. Targeted supplementary identification was undertaken through reference-list checking and web searching for named systems, programmes, and related articles.

The Web of Science strategy was as follows: TS=("bully*" OR "cyberbully*" OR "school bullying" OR "peer bullying" OR "bullying behaviour" OR "bullying behavior") AND TS=("virtual reality" OR VR OR "virtual environment*" OR "immersive environment*" OR "immersive virtual" OR "head-mounted display" OR HMD OR "extended reality" OR XR OR "augmented reality" OR AR OR "mixed reality" OR MR OR simulation OR "virtual simulation" OR "virtual world*") AND PY=(2005-2025). Syntax was adapted to the other databases.

Participant or population K–12 students from kindergarten through Grade 12, including general student samples and students with different bullying-related roles (e.g., victims, perpetrators, bystanders, or defenders).

Intervention XR-based bullying prevention interventions for K–12 students, including VR, AR, immersive 360° media, and interactive virtual environments. Eligible interventions include both direct prevention programmes and prevention-relevant XR applications used for mechanism testing, scenario validation, or feasibility evaluation. XR may support perspective-taking, role participation, simulated decision-making, response practice, feedback, and reflection, either as a stand-alone activity or as part of a broader anti-bullying programme.

Comparator No mandatory comparator is specified. Studies may include non-XR, screen/text, neutral/control, alternative XR, or pre-post comparison conditions; studies without a comparator are also eligible.

Study designs to be included Empirical studies using quantitative, qualitative, or mixed-methods

designs will be included, including randomized and non-randomized trials, quasi-experimental and pre-post studies, between- or within-subject experiments, comparative studies, and empirical mechanism, scenario-validation, design, or feasibility studies relevant to bullying prevention.

Eligibility criteria Eligible sources will be peer-reviewed empirical journal articles published from January 1, 2005 to December 31, 2025. No formal language restriction will be applied, provided sufficient information can be extracted. Studies may be conducted in school, laboratory, home, clinical, or community settings. Articles must provide extractable methods and results and explicitly address bullying prevention or prevention-relevant mechanism testing, scenario validation, or feasibility evaluation. Reviews, protocols, editorials, commentaries, conceptual papers, conference abstracts or proceedings, dissertations, book chapters, and other non-peer-reviewed sources will be excluded.

Information sources A systematic search was conducted on March 13, 2026 in Web of Science, Scopus, ERIC, and PsycINFO. Coverage was limited to publications dated January 1, 2005 through December 31, 2025. The search combined terms for bullying-related phenomena with terms for XR technologies. Targeted supplementary identification was undertaken through reference-list checking and web searching for named systems, programmes, and related articles.

Main outcome(s) The review will map reported outcomes of XR-based bullying prevention, including experiential and feasibility outcomes (e.g., presence, realism, usability, emotional or physiological responses), cognitive and affective/attitudinal outcomes (e.g., bullying recognition, knowledge, empathy, attitudes, and self-efficacy), behavioral intentions and simulated actions (e.g., willingness to defend or intervene, response choices, and strategy use), and real-world bullying-related outcomes (e.g., victimization, perpetration, and defending behavior). Outcomes will be extracted at immediate post-intervention and at any reported follow-up; follow-up periods in the included literature may extend from approximately 1 week to 3 months. Reported effect sizes and statistical results (e.g., standardized mean differences, η^2 /partial η^2 , odds/risk ratios, coefficients, test statistics, and p values) will be extracted where available. Because of heterogeneity in study designs and measures, effect estimates will not be pooled and findings will be synthesized descriptively.

Data management EndNote will be used to import, organize, and manage retrieved references. Duplicate records will be identified and removed in EndNote before title and abstract screening.

Quality assessment / Risk of bias analysis No formal quality assessment or risk-of-bias analysis will be conducted. Consistent with the scoping review design, the purpose of this review is to map the characteristics, configurations, theoretical mechanisms, and reported outcomes of an emerging and heterogeneous evidence base rather than to estimate a pooled intervention effect. Findings will therefore be synthesized descriptively and will not be weighted according to methodological quality or risk of bias.

Strategy of data synthesis Data will be synthesized descriptively. Categorical variables will be summarized using frequencies and percentages, while continuous and textual information will be summarized narratively. The analysis will first map publication, participant, technology, and intervention characteristics. Immersion and interactivity will then be examined as distinct design dimensions, together with the position of XR within the broader intervention structure. Theoretical perspectives, XR affordances, learning activities, and reported outcomes will be linked through qualitative content analysis to identify recurring design patterns. Outcome findings will be organized according to their proximity to the intervention, including experiential and feasibility outcomes; cognitive, affective, and attitudinal outcomes; behavioral intentions and simulated actions; and real-world or longitudinal outcomes. Because substantial heterogeneity is expected across study designs, technologies, measures, and outcomes, effect estimates will not be statistically pooled, and no vote-counting procedure will be used to infer overall intervention effectiveness.

Subgroup analysis No formal statistical subgroup analysis will be conducted because this is a scoping review and effect estimates will not be pooled. Where sufficient studies are available, findings will be compared descriptively across key study and intervention characteristics, particularly immersion level, interactivity level, study function (programme evaluation, mechanism-oriented, or design/feasibility research), and the position of XR within the intervention (stand-alone exposure, repeated core environment, or embedded within a broader programme). Differences by educational level or bullying-related focus may also be described where relevant. These comparisons will

be exploratory and will not be interpreted as tests of subgroup effects.

Sensitivity analysis No formal sensitivity analysis will be conducted because this scoping review will not pool effect estimates or estimate an overall intervention effect. Findings will be synthesized descriptively, making conventional meta-analytic sensitivity analyses not applicable.

Language restriction No restriction.

Country(ies) involved China.

Keywords extended reality; virtual reality; augmented reality; bullying prevention; K-12 education; scoping review.

Dissemination plans The findings of this scoping review will be disseminated through publication in a peer-reviewed academic journal and, where appropriate, presentation at relevant academic conferences. Supplementary materials, including the coding framework and article-level coding table, will be made available alongside the publication where permitted.

Contributions of each author

Author 1 - xianyu li - conducted the initial literature screening, developed the coding framework and coding table, participated in independent data coding and synthesis, and drafted the majority of the original manuscript.

Email: lixiayu@mails.ccnu.edu.cn

Author 2 - zi wang - conducted the secondary literature screening and drafted three sections of the Results.

Email: 18836222992@mails.ccnu.edu.cn

Author 3 - lele li - independently coded the included studies and drafted one subsection of the Results.

Email: lilelee@mails.ccnu.edu.cn

Author 4 - heng lu - the corresponding author, supervised the study, provided conceptual and methodological guidance, and critically reviewed and revised the manuscript.

Email: luoheng@mail.ccnu.edu.cn