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THE EFFECTIVENESS OF THE 'SCHOOL HEROES: BULLYING GIANT CONQUEROR' APPLICATION IN IMPROVING EMPATHY AND ANTI-BULLYING BEHAVIOR AMONG JUNIOR HIGH SCHOOL STUDENTS

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ABSTRACT

Bullying is a major public health concern among adolescents and is associated with adverse psychological and social outcomes, including anxiety, depression, and impaired peer relationships. Empathy has been identified as a key protective factor in reducing bullying behavior, while recent evidence suggests that gamified digital interventions may enhance both emotional and behavioral competencies among students. However, evidence regarding their effectiveness in improving both empathy and anti-bullying behavior, particularly among junior high school students, remains limited. This study aimed to evaluate the effectiveness of the "School Heroes: Bullying Giant Conqueror" application in improving empathy and anti-bullying behavior among junior high school students. A quasi-experimental study with a pretest–posttest control group design was conducted among 80 junior high school students in West Java, Indonesia. Participants were selected using cluster sampling, with two intact classes assigned to the intervention group (n = 40) and the control group (n = 40). Empathy was measured using the Empathy Questionnaire for Children and Adolescents (EmQue-CA), while anti-bullying behavior was assessed using a modified Olweus Bully/Victim Questionnaire. Both instruments showed good validity (corrected item-total correlation > 0.30) and high reliability (Cronbach's alpha = 0.93–0.96 for EmQue-CA and > 0.80 for OBVQ). The intervention group received a gamified digital application over four sessions, while the control group received usual school activities. Data were analyzed using paired t-tests, independent t-tests, mixed-design ANOVA, and multiple linear regression. The intervention group demonstrated significant improvements in empathy (19.85 ± 2.10 to 24.10 ± 2.35, $p < 0.001$) and anti-bullying behavior (58.20 ± 6.45 to 70.35 ± 7.10, $p < 0.001$), whereas the control group showed no significant changes. Posttest comparisons revealed significantly higher scores in the intervention group for both empathy and anti-bullying behavior ($p < 0.001$). Mixed ANOVA analysis indicated $\eta^2 = 0.294$) and anti-bullying behavior ($F = 41.78$, $p < 0.001$, $\eta^2 = 0.349$), indicating a strong intervention effect. Regression analysis showed that empathy was a significant predictor of anti-bullying behavior ($\beta = 0.52$, $p < 0.001$), explaining 41% of the variance. The "School Heroes: Bullying Giant Conqueror" application was effective in significantly improving both empathy and anti-bullying behavior among junior high school students. The findings highlight the potential of culturally relevant, gamified digital interventions as scalable and innovative strategies for bullying prevention in school settings.

Keywords: adolescents; anti-bullying behavior; bullying prevention; digital intervention; empathy; gamification

INTRODUCTION

Bullying remains a significant global public health concern affecting children and adolescents, particularly within school environments. It is defined as repeated aggressive behavior involving a power imbalance, where individuals are intentionally harmed physically, verbally, or psychologically. Recent evidence indicates that bullying is associated with a wide range of adverse outcomes, including depression, anxiety, low self-esteem, academic difficulties, and even long-term mental health disorders(Armitage, 2021; Hamm et al., 2015)Adolescents at the junior high school level are especially vulnerable due to developmental transitions involving identity formation, peer

influence, and emotional regulation, which increase both exposure to and participation in bullying behaviors (Qiao et al., 2026).

School-based interventions have been widely implemented as a primary strategy to prevent and reduce bullying. Traditional programs, such as social-emotional learning (SEL) and whole-school approaches, have demonstrated effectiveness in improving students' social competence and reducing aggressive behaviors (Gaffney et al., 2019a). Among the various protective factors, empathy has consistently been identified as a key mechanism underlying reductions in bullying behavior. Empathy enables individuals to understand and share the feelings of others, thereby discouraging harmful actions and promoting prosocial responses (Garandeau et al., 2022). Studies have shown that interventions targeting empathy development can significantly reduce bullying perpetration and increase defending behaviors among peers (Gaffney et al., 2019b).

In recent years, digital and game-based learning approaches have emerged as innovative tools in bullying prevention. Gamification integrates elements such as storytelling, challenges, rewards, and interactivity to enhance user engagement and learning outcomes. Evidence suggests that game-based interventions can effectively improve knowledge, emotional engagement, and behavioral intentions among adolescents (Liu et al., 2024a). Furthermore, digital platforms provide scalable and accessible solutions that align with adolescents' familiarity with technology, making them particularly suitable for school-based interventions (Kowalski et al., 2023). Gamified anti-bullying applications have been reported to increase empathy, awareness, and bystander intervention behaviors by simulating real-life social situations in a safe and interactive environment (Vasquez-López & O'Connor, 2025).

Despite the growing body of literature, several important gaps remain. First, existing studies have reported mixed findings regarding the effectiveness of digital interventions, with some demonstrating improvements in knowledge and attitudes but limited impact on actual behavioral outcomes (Gaffney et al., 2019b; Lamas et al., 2023). This indicates a need for further investigation into interventions that can influence both psychological (e.g., empathy) and behavioral domains simultaneously. Second, many studies have predominantly focused on elementary school populations, while evidence among junior high school students who face more complex peer dynamics and social pressures remains relatively limited (Modecki et al., 2020). Third, there is a lack of research evaluating culturally tailored, locally developed digital interventions, which may be more relevant and effective in specific educational contexts.

To address these gaps, this study evaluates the effectiveness of the "School Heroes: Bullying Giant Conqueror" application, a gamified educational tool designed to enhance empathy and promote anti-bullying behavior among junior high school students. Using a quasi-experimental pretest–posttest control group design, this study aims to provide empirical evidence on the role of culturally relevant digital interventions in improving both psychological and behavioral outcomes related to bullying prevention. The findings are expected to contribute to the development of innovative, scalable, and contextually appropriate strategies for fostering safer school environments.

METHOD

Study Design

This study employed a quasi-experimental design with a pretest–posttest control group approach to evaluate the effectiveness of a gamified educational intervention in improving empathy and anti-bullying behavior among junior high school students. This design is appropriate for school-based interventions where random allocation at the individual level is not feasible and has been widely used in behavioral and educational research.

Setting and Participants

The study was conducted in a public junior high school in West Java, Indonesia. The target population consisted of students aged 12–15 years enrolled in Grades VII–IX. A cluster sampling technique was employed, in which naturally occurring groups (intact classes) were selected as sampling units rather than individual students. This approach is commonly used in school-based research to enhance feasibility and to reduce the risk of contamination between participants. Two intact classes with similar academic characteristics were selected; one class was assigned as the intervention group, while the other served as the control group to minimize contamination bias.

Participants were included if they were registered as active junior high school students (Grades VII–IX), aged between 12 and 15 years, able to read and understand Bahasa Indonesia, and had provided written informed assent along with parental consent. Students were excluded if they had identified cognitive or developmental disorders, were absent during the intervention sessions, or did not complete either the pretest or posttest assessments. The required sample size was calculated using GPower version 3.1 for repeated measures ANOVA (within–between interaction). Assuming a medium effect size ($f = 0.25$), an alpha level of 0.05, statistical power of 0.80, two groups, and two measurement points (pretest and posttest), the minimum required sample size was 68 participants (34 per group). To account for potential attrition of approximately 15%, the total sample size was increased to 80 participants (40 per group). The use of GPower for sample size estimation is recommended to ensure adequate statistical power in intervention studies.

Instruments

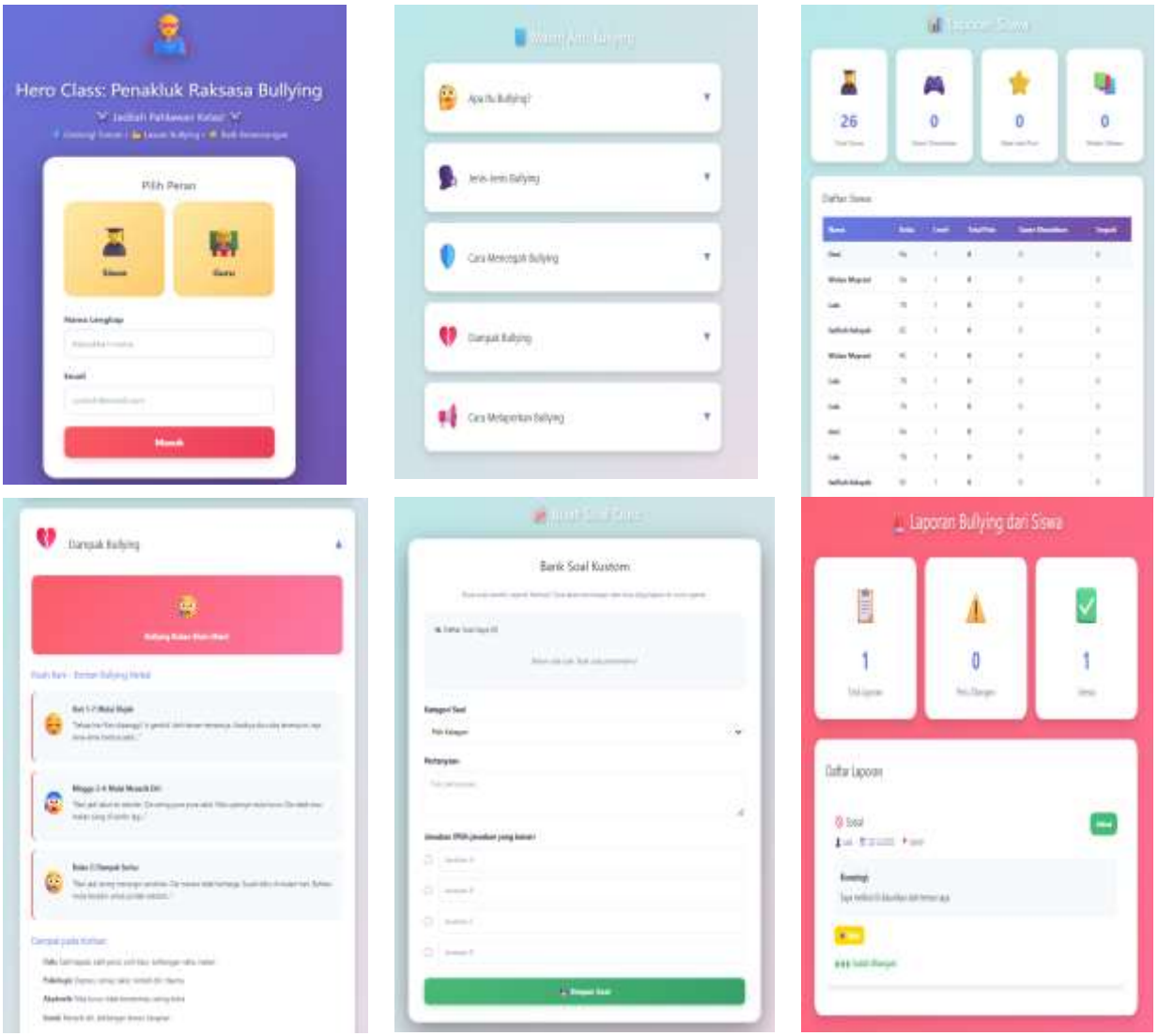
Empathy was measured using the Empathy Questionnaire for Children and Adolescents (EmQue-CA) developed by Rieffe et al. (2010). This instrument consists of 10 items covering three domains: affective empathy, cognitive empathy, and intention to comfort. Responses are rated on a 3-point Likert scale ranging from 1 (not true) to 3 (often true), with total scores ranging from 10 to 30, where higher scores indicate higher levels of empathy. Prior to data collection, the instrument underwent validity and reliability testing. The results of the validity test using corrected item-total correlation showed that all items were valid ($r > 0.30$). Reliability testing demonstrated excellent internal consistency, with Cronbach's alpha values ranging from 0.93 to 0.96, indicating strong reliability among adolescent populations (Wuryaningsih et al., 2025).

Anti-bullying behavior was assessed using a modified version of the Olweus Bully/Victim Questionnaire (OBVQ) developed by Olweus (1996), which has been widely used in bullying research. The adapted instrument consists of approximately 18–20 items measuring bystander intervention, helping behavior, and reporting behavior. Responses are scored on a 5-point Likert scale ranging from 1 (never) to 5 (always), with higher scores indicating stronger anti-bullying behavior. The modified instrument was also tested for validity and reliability prior to use. All items were found to be valid based on corrected item-total correlation values ($r > 0.30$). The reliability test showed good internal consistency, with Cronbach's alpha values exceeding 0.80, indicating that the instrument is reliable for use in adolescent populations (Ferdian et al., 2024).

School Heroes: Bullying Giant Conqueror Application

The HeroClass: Conqueror of the Bullying Giant application is a web-based interactive digital educational platform designed as a preventive effort to reduce bullying behavior among junior high school students. This application integrates educational materials, quiz-based games, and reporting features into a single engaging and easily accessible platform. The system is developed using a role-based approach, which differentiates access rights between student and teacher users. Students act as the primary users who can access learning materials related to the definition, types, impacts, and ways to prevent and report bullying, while also participating in educational games to actively enhance their understanding. Meanwhile, teachers serve as supervisors and facilitators who can monitor student progress, manage quiz questions, and follow up on reported bullying cases. This

application was developed by Nata Ristanti and colleagues as part of a technology-based learning innovation in the field of health education.



Picture 1. School Heroes: Bullying Giant Conqueror Application

The application usage flow begins with user authentication through the login page, followed by role selection, which determines the interface and accessible features. After successfully logging into the system, users are directed to the main dashboard according to their respective roles. The student dashboard includes menus such as profile, educational materials, games (both solo and join room), and a bullying reporting feature. In contrast, the teacher dashboard provides menus for accessing materials, creating and managing quizzes, monitoring students' learning outcomes, and managing bullying incident reports. Through a gamification approach incorporating points, levels, and challenges, this application is expected to enhance learning motivation, foster empathy, and encourage students to confidently report bullying incidents.

Procedure

The study was conducted through several sequential stages. Ethical clearance was obtained from the Institutional Review Board (IRB) of Sekolah Tinggi Ilmu Keperawatan PPNI Jawa Barat (Approval No: 0154/III/KEPK/STIKep/PPNI/Jabar/I/2026) Following ethical approval, administrative permission was obtained from the school principal and relevant authorities to conduct the study. Eligible participants were then identified, and written informed consent was obtained from parents or guardians, while students provided assent prior to participation.

Baseline data collection was conducted through pretest assessments, in which both the intervention and control groups completed standardized questionnaires measuring empathy and anti-bullying behavior. The intervention was subsequently implemented, with the intervention group participating in application-based sessions under supervision, while the control group continued their usual school activities without exposure to the intervention. Upon completion of the intervention period, posttest assessments were administered to both groups using the same set of questionnaires to evaluate changes in outcomes. In addition, students in the intervention group were asked to provide structured feedback regarding the usability, engagement, and perceived usefulness of the application.

Data Analysis

Data were analyzed using IBM SPSS Statistics version 26. Descriptive statistics, including means, standard deviations, frequencies, and percentages, were calculated to describe participant characteristics and study variables. Prior to inferential analysis, assumption testing was conducted to ensure data suitability. Normality of the data distribution was assessed using the Shapiro Wilk test, while homogeneity of variance was evaluated using Levene's test. Inferential analyses were performed to examine the effectiveness of the intervention. Paired t-tests were used to assess within-group differences between pretest and posttest scores, while independent t-tests were conducted to compare differences between the intervention and control groups. Furthermore, a mixed-design ANOVA (repeated measures ANOVA) was applied to evaluate the interaction effects between time (pretest and posttest) and group (intervention and control).

Effect sizes were calculated using partial eta squared (η^2) to determine the magnitude of the intervention effect, with values of 0.01, 0.06, and 0.14 interpreted as small, medium, and large effects, respectively. . Additionally, multiple linear regression analysis was conducted to identify predictors of anti-bullying behavior while controlling for relevant demographic variables. A p-value of less than 0.05 was considered statistically significant.

RESULT

A total of 80 students participated in this study, comprising 40 students in the intervention group and 40 students in the control group. All participants completed both pretest and posttest assessments, resulting in a 100% response rate. The demographic characteristics of the participants are presented in Table 1. The demographic distribution between the intervention and control groups was comparable in terms of age, gender, and grade level, indicating that the two groups were homogeneous at baseline and suitable for comparison.

Table 1.
Demographic Characteristics of Participants (N = 80)

Characteristics	Intervention (n=40)	Control (n=40)	Total (N=80)
Age (Mean ± SD)	13.40 ± 0.90	13.50 ± 0.80	13.45 ± 0.85
Gender			
Male	18 (45.0%)	17 (42.5%)	35 (43.8%)
Female	22 (55.0%)	23 (57.5%)	45 (56.2%)
Grade Level			
Grade VII	14 (35.0%)	15 (37.5%)	29 (36.2%)
Grade VIII	13 (32.5%)	12 (30.0%)	25 (31.3%)
Grade IX	13 (32.5%)	13 (32.5%)	26 (32.5%)

Baseline comparisons were conducted to assess the equivalence of the intervention and control groups prior to the intervention. As shown in Table 2, there were no statistically significant differences in empathy or anti-bullying behavior scores between the two groups ($p > 0.05$). The absence of significant differences at baseline indicates that both groups started from a similar level, thereby strengthening the internal validity of the study.

Table 2.
Baseline Comparison of Study Variables

Variable	Intervention (Mean ± SD)	Control (Mean ± SD)	p-value
Empathy	19.85 ± 2.10	19.60 ± 2.25	0.621
Anti-bullying behavior	58.20 ± 6.45	57.75 ± 6.80	0.734

Changes in empathy and anti-bullying behavior within each group were analyzed using paired t-tests. As presented in Table 3, the intervention group demonstrated statistically significant improvements in both variables following the intervention ($p < 0.001$), whereas the control group showed no significant changes. These findings indicate that the intervention significantly enhanced both empathy and anti-bullying behavior among students, while no meaningful changes occurred in the control group.

Table 3.
Within-Group Comparison of Pretest and Posttest Scores

Variable	Group	Pretest (Mean ± SD)	Posttest (Mean ± SD)	p-value
Empathy	Intervention	19.85 ± 2.10	24.10 ± 2.35	<0.001
	Control	19.60 ± 2.25	20.10 ± 2.40	0.081
Anti-bullying behavior	Intervention	58.20 ± 6.45	70.35 ± 7.10	<0.001
	Control	57.75 ± 6.80	59.10 ± 6.95	0.067

Independent t-test analysis revealed significant differences between groups at posttest. As shown in Table 4, the intervention group had significantly higher empathy and anti-bullying behavior scores compared to the control group ($p < 0.001$). The significant differences observed between groups further confirm the effectiveness of the application in improving both psychological and behavioral outcomes.

Table 4.
Between-Group Comparison of Posttest Scores

Variable	Intervention (Mean ± SD)	Control (Mean ± SD)	p-value
Empathy	24.10 ± 2.35	20.10 ± 2.40	<0.001
Anti-bullying behavior	70.35 ± 7.10	59.10 ± 6.95	<0.001

To further examine the effectiveness of the intervention over time, a mixed-design ANOVA was conducted. As presented in Table 5, there were significant interaction effects between time and group for both empathy and anti-bullying behavior ($p < 0.001$). The significant interaction effects indicate that the observed improvements in the intervention group were attributable to the intervention rather than time alone. The effect sizes were large ($\eta^2 > 0.14$), suggesting a substantial impact of the application.

Table 5.
Mixed ANOVA Results for Interaction Effects

Variable	F (Time × Group)	p-value	Partial η^2
Empathy	32.45	<0.001	0.294
Anti-bullying behavior	41.78	<0.001	0.349

Multiple linear regression analysis was conducted to identify factors associated with anti-bullying behavior. As shown in Table 6, empathy was found to be a significant predictor ($p < 0.001$), while age and gender were not significant. Empathy significantly contributed to anti-bullying behavior, explaining 41% of the variance. This finding highlights the importance of empathy as a key mechanism underlying behavioral change.

Table 6.
Multiple Linear Regression Analysis

Variable	B	SE	Beta	p-value
Empathy	1.25	0.28	0.52	<0.001
Age	0.45	0.30	0.12	0.142
Gender	1.10	1.05	0.09	0.298

*$R^2 = 0.41$

Overall, the results demonstrate that the “School Heroes: Bullying Giant Conqueror” application was effective in significantly improving both empathy and anti-bullying behavior among junior high school students. The intervention produced statistically significant results across multiple analyses,

including within-group, between-group, and interaction effects, with large effect sizes. These findings support the potential of culturally relevant, gamified digital interventions as scalable strategies for bullying prevention in school settings.

DISCUSSION

The present study examined the effectiveness of the "School Heroes: Bullying Giant Conqueror" application in improving empathy and anti-bullying behavior among junior high school students. The findings demonstrated that the intervention produced statistically significant improvements in both outcomes, with large effect sizes and consistent results across within-group, between-group, and interaction analyses. The absence of baseline differences between groups further strengthens the internal validity of the study, indicating that the observed changes can be attributed to the intervention.

The significant improvement in empathy observed in the intervention group is consistent with previous research highlighting the role of digital and game-based learning in enhancing socio-emotional competencies among adolescents. Empathy has been identified as a key protective factor against bullying, as it fosters emotional understanding and reduces aggressive tendencies (Zych et al., 2019). A study by Ferreira et al. (2022) demonstrated that serious games can effectively enhance emotional engagement and perspective-taking by simulating real-life social situations (Ferreira et al., 2022). Similarly, a systematic review by Kowalski et al. (2021) emphasized that digital interventions, particularly those incorporating interactive and immersive elements, can positively influence adolescents' social awareness and peer interactions. The findings of the present study support these conclusions, suggesting that the application's gamified features such as storytelling, role-playing, and scenario-based decision-making play a critical role in facilitating empathy development(Kowalski et al., 2023).

In addition to empathy, the intervention significantly improved anti-bullying behavior. This finding aligns with evidence from meta-analyses indicating that school-based interventions targeting social-emotional learning can reduce bullying and increase prosocial behaviors (Gaffney et al., 2019b). The observed behavioral changes may be explained by the experiential learning process embedded in the application, which allows students to actively engage with bullying scenarios and practice appropriate responses. Unlike traditional didactic approaches, gamified interventions provide immediate feedback and reinforcement, which may enhance behavioral retention and transfer to real-life situations. The significant interaction effects observed in the mixed ANOVA further confirm that these improvements were attributable to the intervention rather than external influences or maturation effects.

The regression analysis revealed that empathy was a significant predictor of anti-bullying behavior, explaining a substantial proportion of variance. This finding is consistent with existing theoretical and empirical literature suggesting that empathy serves as a foundational mechanism underlying prosocial behavior and bystander intervention (Trach et al., 2023). Adolescents who are able to recognize and share the emotional experiences of others are more likely to engage in supportive actions and refrain from harmful behaviors. Therefore, interventions that effectively enhance empathy may have a cascading impact on behavioral outcomes, as demonstrated in this study.

This study contributes to the existing body of knowledge in several important ways. First, it provides empirical evidence that a gamified digital intervention can simultaneously improve both psychological (empathy) and behavioral (anti-bullying behavior) outcomes, addressing inconsistencies in previous findings where behavioral changes were often limited (Liu et al., 2024b). Second, it focuses on junior high school students, a population characterized by complex peer dynamics and heightened vulnerability to bullying, yet relatively underrepresented in intervention studies Third, the intervention was culturally contextualized and locally developed, which may enhance its relevance, acceptability, and effectiveness compared to standardized or

externally developed programs. These findings highlight the importance of culturally adaptive and technology-driven approaches in bullying prevention (Ariani et al., 2025).

Clinical and Educational Implications

The findings of this study have important implications for nursing practice, school health services, and educational policy. School nurses and community health professionals can integrate gamified digital interventions into preventive mental health programs to address bullying and promote socio-emotional development among adolescents. Such interventions offer a scalable and cost-effective approach that aligns with adolescents' digital engagement and learning preferences. Furthermore, the strong association between empathy and anti-bullying behavior suggests that interventions targeting emotional competencies should be prioritized in school-based health promotion programs. Educators and policymakers are encouraged to incorporate interactive and technology-based learning tools into curricula to foster safer and more supportive school environments. The application evaluated in this study demonstrates potential as an innovative and culturally relevant tool that can be implemented across diverse educational settings.

Study Limitations

Despite its strengths, this study has several limitations. The use of a quasi-experimental design without randomization may introduce potential selection bias, although the baseline equivalence between groups reduces this concern. The study was conducted in a single school, which may limit the generalizability of the findings to other populations or contexts. Additionally, the reliance on self-reported measures may be subject to social desirability bias, particularly in assessing behavioral outcomes. The relatively short duration of the intervention also limits the ability to evaluate the long-term sustainability of its effects. Future research should consider randomized controlled designs, larger and more diverse samples, objective behavioral measures, and longitudinal follow-up to strengthen the evidence base.

CONCLUSION

In conclusion, the "School Heroes: Bullying Giant Conqueror" application was effective in significantly improving empathy and anti-bullying behavior among junior high school students. The intervention demonstrated robust statistical significance and large effect sizes, supporting its potential as a culturally relevant and scalable digital tool for bullying prevention. These findings underscore the critical role of empathy in promoting prosocial behavior and highlight the value of integrating gamified educational interventions into school-based health and educational programs. Future studies are warranted to explore long-term outcomes and broader implementation across diverse settings.

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