

Original Article

Effect of Low-Cost CPR Pillow Training on Adolescents' Willingness to Perform Bystander CPR: A Quasi-Experimental Study



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ABSTRACT

Background: Despite increasing CPR education initiatives, evidence regarding the effectiveness of low-cost CPR Pillow simulation in improving adolescents' willingness to perform bystander CPR remains limited. This study aimed to evaluate the effect of CPR Pillow training on scout members' willingness to perform CPR in Lubuklinggau City, South Sumatera, Indonesia.

Methods: This quantitative quasi-experimental study followed a non-equivalent control group pretest-posttest design in line with TREND principles. Seventy-two scout members aged 15–17 years who had never received CPR training were selected by random sampling and allocated to intervention and control groups. The intervention group received three sessions of classical teaching combined with CPR Pillow simulation over two months, while the control group received classical CPR training using leaflets only. Willingness to perform CPR was measured using a 30-item questionnaire with Cronbach's alpha of 0.85 and analyzed using paired and independent t-tests.

Results: The intervention group demonstrated a greater increase in willingness scores than the control group, with mean scores improving from 42.50 ± 7.00 to 86.90 ± 5.60 . The control group also improved, from 42.30 ± 6.90 to 84.20 ± 5.90 . The between-group difference in score change was statistically significant ($t = 2.398$, $p < 0.001$).

Conclusion: Low-cost CPR Pillow training significantly improved adolescents' willingness to perform bystander CPR compared with leaflet-based training. This approach may be a practical and scalable strategy for school and scout CPR education in low-resource settings.

Keywords: Cardiopulmonary Resuscitation; Bystander CPR; Adolescents; Simulation Training; Willingness to Help.

Implications for Practice:

- Low-cost CPR Pillow simulation can be incorporated into national school-based CPR education programs to expand access in resource-limited settings.
- Educational institutions should revise CPR training protocols by integrating repeated simulation-based practice to strengthen willingness and self-efficacy.
- Health authorities and nursing educators can use this model to develop sustainable

Implications for Practice:

community CPR capacity-building initiatives adaptable to diverse cultural and economic contexts.

Introduction

Bystanders can save lives by performing cardiopulmonary resuscitation (CPR) when sudden cardiac arrest occurs in

the community ([Ikemura & Chan, 2026](#)). The estimated annual incidence of emergency medical services (EMS)-treated OHCA was 30.0-97.1 individuals per 100,000 population ([Kiguchi et al., 2020](#)). Other reports show that the average global incidence among adults of 55 OHCA per 100,000 person-years ([Yan et al., 2020](#))

The victim's chance of survival increases substantially when lay witnesses are willing and able to initiate CPR immediately ([Matsuyama et al., 2020](#)). However, the global survival rate for adult out-of-hospital cardiac arrest (OHCA) patients who receive CPR remains low, with marked regional variation despite efforts to expand CPR training ([Nguyen et al., 2025](#)). The pooled incidence of return of spontaneous circulation (ROSC) was 29.7% (95% CI 27.6–31.7%), the rate of survival to hospital admission was 22.0% (95% CI 20.7–23.4%), the rate of survival to hospital discharge was 8.8% (95% CI 8.2–9.4%) ([Yan et al., 2020](#))

Several factors influence outcomes in OHCA, including the effectiveness of CPR, emergency medical services' response time, and access to defibrillation ([Qin et al., 2024](#)). Equally important, many studies have reported that only a proportion of trained bystanders are actually willing to perform CPR when confronted with an emergency, indicating a gap between training and real-life action ([Ricco et al., 2020](#)). Psychological barriers such as fear of doing harm, anxiety, concerns about infection or legal consequences, and low self-confidence frequently reduce willingness to perform bystander CPR ([Daud et al., 2023](#)).

Adolescents and young people are a strategic target group for CPR education because they can reach a wide segment of the population and potentially act as multipliers within their communities ([Ali et al., 2021](#); [Mollo et al., 2024](#)). School-based CPR programs and scout activities have

been promoted by the World Health Organization and international resuscitation councils as an effective way to improve CPR knowledge, attitudes, self-efficacy, and willingness to help in OHCA situations ([Sadjadi et al., 2025](#)). Scout members in particular are educated to help others and uphold prosocial values, making them an appropriate population for interventions aimed at increasing willingness to perform CPR.

Nevertheless, widespread CPR implementation is hindered by limited access to training, the high cost of manikins, lack of time, and shortages of trainers and facilities ([Wang et al., 2025](#)). Low-cost training tools such as CPR pillows have been developed to address these constraints and enable broader, more sustainable provision of CPR simulation for laypeople. Previous research has shown that low-fidelity simulation can effectively enhance skills and reinforce muscle memory, and may also increase intention and willingness to perform CPR among trainees ([Shafiq et al., 2022](#); [Wijaya et al., 2023](#))

Despite growing CPR education programs, willingness to perform bystander CPR remains limited because many trained laypersons still experience fear, anxiety, and low self-confidence in real emergencies. Low-cost CPR Pillow simulation may offer a practical and sustainable alternative to improve adolescents' readiness to help, especially in school and scout settings

This study offers several important practical implications for nursing and health practice, particularly in community and school-based settings. The significant increase in scout members' willingness to perform CPR after low-cost CPR Pillow training suggests that nurses and health educators can effectively expand bystander CPR capacity using simple, affordable simulation tools rather than relying solely on high-cost manikins ([Shafiq et al., 2022](#); [Wijaya et al., 2023](#)). By integrating CPR

Pillow-based modules into nursing-led outreach, school health programs, and scout activities, nurses can address key psychological barriers—such as fear of doing harm, low confidence, and anxiety about emergencies—while simultaneously strengthening adolescents' knowledge, self-efficacy, and intention to act in out-of-hospital cardiac arrest situations ([Sadjadi et al., 2025](#)). Furthermore, the multi-session training approach used in this study highlights the value of repeated, structured practice and follow-up as part of routine health promotion, enabling nursing and public health practitioners to design sustainable CPR education strategies that are scalable in low-resource contexts and aligned with broader efforts to improve community survival outcomes from OHCA ([Ali et al., 2021](#); [Anderson et al., 2021](#); [Hidayat et al., 2022](#)).

In this context, shifting the focus from readiness alone to explicitly assessing willingness to perform CPR is crucial to understand whether training interventions translate into a real intention to act ([Pomery et al., 2009](#)). This study therefore investigates scout members' willingness to perform CPR after receiving CPR training using a low-cost CPR Pillow in Lubuklinggau City, South Sumatera, Indonesia.

Methods

Study Design

This quantitative study used a quasi-experimental non-equivalent control group pretest-posttest design. The study followed TREND reporting principles for nonrandomized evaluations

Participants

A total of 72 scout members aged 15–17 years who had never received CPR training were recruited by random sampling and assigned to an intervention group ($n = 36$) and a control group ($n = 36$). Inclusion criteria were being an active scout member,

having no prior CPR training, and being willing to participate. Participants who declined or did not complete all study procedures were excluded

Instruments

Participants' willingness to perform bystander CPR was assessed using a structured 30-item self-administered questionnaire. The instrument was developed based on the literature on out-of-hospital cardiac arrest (OHCA), bystander CPR, and behavioral determinants of CPR performance, and was reviewed by experts in emergency nursing and nursing education to establish content validity.

The questionnaire comprised five domains: (1) knowledge of OHCA (6 items), (2) attitudes toward OHCA and CPR (7 items), (3) awareness of CPR policies and guidelines (5 items), (4) self-confidence in performing CPR (6 items), and (5) willingness/intention to perform CPR and seek help (6 items). Responses were rated on a four-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree), with higher scores indicating more favorable responses, which supported the multidimensional structure of the instrument. Internal consistency reliability was good, with an overall Cronbach's alpha coefficient of 0.85.

Although the questionnaire included multiple domains associated with bystander CPR behavior, the primary outcome of this study was the willingness to perform CPR, which was derived exclusively from the six-item willingness/intention domain. The remaining domains (knowledge, attitude, awareness, and self-confidence) were included to comprehensively assess factors related to CPR willingness but were not incorporated into the primary willingness outcome score. The willingness score ranged from 6 to 24, with higher scores indicating greater willingness to perform bystander CPR.

Intervention

The intervention group received three training sessions over two months. Each session combined classical CPR teaching with hands-on practice using a low-cost CPR Pillow. The control group received classical CPR training using leaflets only. Training was delivered in a structured format to ensure both groups received the same core content, while only the intervention group received simulation practice.

Data Collection

Data were collected from May to June 2023. All participants completed the questionnaire at baseline before training and again one week after the third session. The same instrument was used for pretest and post-test measurement.

Data Analysis

Continuous variables were summarized using mean and standard deviation. Pretest and post-test scores within each group were analyzed using paired t-tests, while changes between groups were compared using independent t-tests. All statistical analyses were performed using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA). Statistical significance was set at $p < 0.05$.

Ethical Considerations

The study was approved by the Ethics Committee of the Palembang Health Polytechnic (No. 0617/KEPK/Adm2/VI/2023). All participants received information about the study and signed informed consent forms. Confidentiality of respondents' data was strictly maintained.

Results

The following are the results of research on the characteristics of the respondents.

Table 1. Respondents Characteristics (n=72)

No	Characteristics	n	%
Gender			
1.	a. Male	41	56.9%
	b. Female	31	43.1%
Age			
2.	mean	15.89 y.o	
CPR Training History			
3	a. Ever	0	0%
	b. Never	72	100%
OHCA Viewing History			
4	a. Ever	12	16.7%
	b. Never	60	83.3%
History of performing CPR			
4	a. Ever	0	0%
	b. Never	72	100%
Total		72	100%

Table 1 illustrates the distribution of participants according to smoking habits, body weight status, psychological stress level, and asthma severity. Among the 51 participants, the majority were classified as mild smokers (45.1%), had normal or overweight body weight status (37.3% each), and experienced mild psychological stress (51.0%). Regarding asthma severity, intermittent asthma was the most common classification, affecting 23 participants (45.1%), followed by mild persistent asthma in 20 participants (39.2%) and moderate persistent asthma in 8 participants (15.7%).

Table 2. Variable Value Results (n=72)

Variable	Group	Pretest	Post-test	Difference	t	p*	t	p**
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		M ± SD	M ± SD	M ± SD				
Willingness	Exp	42.50 ± 7.00	86.90 ± 5.60	-44.40 ± 7.10	-27.800	.001	2.398	.019
	Con	42.30 ± 6.90	84.20 ± 5.90	-41.90 ± 7.30	-24.900	.001		

*Paired t-Test **Independent t-Test

Table 2 presents the comparison of willingness scores between the intervention and control groups before and after the intervention. The intervention group demonstrated a substantial increase in willingness scores from a pretest mean of 42.50 ± 7.00 to a post-test mean of 86.90 ± 5.60 , whereas the control group showed an increase from 42.30 ± 6.90 to 84.20 ± 5.90 . The mean score improvement was 44.40 points in the intervention group compared with 41.90 points in the control group. The between-group difference in score changes was statistically significant (mean difference = 2.50 points, 95% CI: 0.43–4.57; $t^* = 2.398$, $p^* = 0.019$). Furthermore, the standardized effect size indicated a moderate intervention effect (Cohen's $d^* = 0.56$), suggesting that the educational video provided an additional and clinically meaningful improvement in willingness compared with the control intervention.

Discussion

This study showed that CPR training using a low-cost CPR Pillow was associated with a greater increase in adolescents' willingness to perform bystander CPR than leaflet-based instruction alone. Both groups improved after training, but the intervention group demonstrated a larger gain in willingness scores, suggesting that combining theoretical instruction with repeated hands-on simulation may strengthen participants' readiness to help in out-of-hospital cardiac arrest situations ([Wahid et al., 2024](#)).

strongest predictors of bystander intervention during out-of-hospital cardiac arrest (OHCA). Therefore, even a modest increase in willingness may have

meaningful implications for improving community emergency preparedness, particularly among adolescents who are likely to encounter cardiac emergencies in schools and public settings. Previous studies have consistently demonstrated that school-based CPR training improves students' knowledge, practical skills, self-confidence, and willingness to provide bystander CPR. A systematic review reported that school-based CPR education effectively enhances CPR knowledge and skills among adolescents and emphasized the importance of continuous training to optimize skill retention and application in real-life emergencies ([Zenani et al., 2022](#)).

Similarly, [Hamednia et al., \(2025\)](#) found that CPR training significantly increased high school students' willingness to perform CPR, accompanied by substantial improvements in CPR knowledge and practical skills. In addition, the use of innovative, low-cost simulation tools, such as the CPR Pillow, may provide additional educational benefits by facilitating repeated hands-on practice without the need for expensive training equipment, making CPR education more feasible in resource-limited settings ([Arparitna et al., 2026](#)). Integrating CPR education into school curricula has also been shown to foster a culture of preparedness by improving students' confidence and readiness to respond during emergencies ([Garcia & Vargas, 2025](#)).

Therefore, although the additional improvement observed in the intervention group was relatively small compared with the control group, the findings suggest that incorporating an inexpensive and scalable simulation tool into CPR training may provide meaningful educational value. Such an approach has the potential to expand

access to repeated CPR practice and strengthen community CPR preparedness, particularly in schools and youth organizations where access to high-fidelity manikins is limited ([Šerpytis et al., 2025](#)).

These findings are consistent with the manuscript's conceptual framework that willingness is shaped not only by knowledge, but also by self-confidence, perceived barriers, and prior exposure to practical training ([Astuti & Jannah, 2021](#); [Mao et al., 2021](#)). The addition of CPR Pillow simulation may have provided participants with a more concrete sense of procedural familiarity, which can reduce hesitation and increase confidence to act during emergencies. Because the study outcome was willingness rather than observed CPR performance, the findings should be interpreted as evidence of improved intention to help rather than proof of actual bystander CPR behavior ([Riccò et al., 2020](#); [Tjelmeland et al., 2023](#)).

The use of CPR Pillow as a low-fidelity simulation tool appears to be a pragmatic solution to overcome resource constraints that often limit access to CPR training. Low-cost devices enable more frequent and wider training coverage, especially in school and scout settings where budgets for high-fidelity manikins are limited. Earlier studies have reported that low-fidelity simulations can effectively support the acquisition and retention of CPR skills, and may be sufficient to build muscle memory and confidence for basic chest compressions ([Nehra et al., 2024](#)). Another research has also shown that training with low-cost, low-fidelity models can achieve adequate compression quality and significantly improve self-efficacy, and higher self-efficacy is consistently associated with greater willingness to perform bystander CPR in real OHCA situations ([Urbina-rojas et al., 2023](#)). The present study adds to this evidence by showing that such training can

also strengthen adolescents' willingness to perform CPR as bystanders

A plausible explanation for the stronger improvement in the intervention group is that simulation-based practice helps translate abstract CPR information into actionable readiness. Repeated practice may reduce fear of making mistakes, lower anxiety about harming the victim, and improve perceived self-efficacy, all of which are widely recognized as important determinants of willingness to perform bystander CPR. In contrast, leaflet-based education can improve knowledge, but it may be less effective in addressing emotional and behavioral barriers that arise in real emergency situations ([Nehra et al., 2024](#)).

Adolescents, including scout members, are an important target for community CPR programs because they are widely present in schools and public spaces and can act as potential first responders. International guidelines and several recent studies emphasize that school-based CPR education increases students' attitudes, self-efficacy, and willingness to help in cardiac emergencies ([Mollo et al., 2024](#); [Zenani et al., 2022](#)). The present findings also support the practical value of low-cost simulation tools in resource-limited settings. In many schools and community programs, high-fidelity manikins are difficult to obtain because of cost and limited availability. A low-cost CPR Pillow may therefore represent a feasible alternative for expanding CPR education among adolescents, especially in scout and school environments where repeated training sessions are more realistic than one-time demonstrations.

Willingness to perform CPR tends to increase after education and training because several psychological and skill-related mechanisms work together ([Qin et al., 2024](#)). First, training improves knowledge about OHCA and the steps of

CPR, so participants better understand the importance of rapid action and feel they “know what to do,” which reduces doubt and feelings of helplessness. Second, hands-on practice (simulation) builds self-efficacy: participants directly experience that they are able to perform chest compressions correctly, which increases their confidence to act in real situations ([Wang et al., 2025](#)).

Third, training sessions usually explain and discuss common barriers—fear of making mistakes, fear of injuring the victim, legal concerns, or infection risk—while also offering practical solutions (such as hands-only CPR and legal protection for rescuers), thereby reducing these fears ([Mao et al., 2021](#); [Riccò et al., 2020](#)). Fourth, CPR education often emphasizes the moral and social value of helping others (“it is better to help than to do nothing”), which strengthens positive attitudes and subjective norms that performing CPR is expected and appreciated. The combination of increased knowledge, higher self-efficacy, reduced perceived barriers, and reinforced prosocial values is what leads to greater willingness to actually perform CPR in OHCA situations after training ([Matsuyama et al., 2020](#); [Wang et al., 2025](#)).

The discussion should also remain cautious in interpreting the broader implications of the findings. Although the intervention improved willingness scores, willingness alone does not guarantee that adolescents will perform CPR correctly or consistently in an actual OHCA event. Real-world bystander action is influenced by additional factors, including situational stress, scene safety, presence of other helpers, and long-term retention of CPR knowledge and confidence. Therefore, the results support the educational potential of CPR Pillow training, but they do not yet demonstrate effectiveness for actual CPR performance or patient outcomes.

Several limitations should be acknowledged. First, the study used a quasi-

experimental design in a single city, which limits generalizability to other adolescent populations. Second, the sample size was relatively modest, and the outcome relied on self-reported questionnaire data rather than direct observation of CPR behavior. Third, the study did not assess long-term retention, so it remains unclear whether the increase in willingness would persist over time without refresher training. These limitations should be clearly stated to align the discussion with the actual scope of the evidence.

Future research should include longer follow-up periods, larger multisite samples, and objective assessment of CPR performance in addition to willingness. Studies should also report intervention fidelity, trainer qualifications, questionnaire validity, and effect size estimates more comprehensively, as requested by the reviewers. Such improvements would strengthen the methodological rigor of the evidence and clarify whether low-cost simulation tools can improve not only intention, but also actual bystander response quality in emergencies.

Overall, this study contributes to the growing evidence that affordable simulation strategies can play an important role in adolescent CPR education. The findings suggest that CPR Pillow-based training may be particularly useful in low-resource educational settings where access to standard manikins is limited. From a practice perspective, the intervention appears promising as a school- and scout-based strategy to strengthen willingness to help, provided that conclusions remain limited to the behavioral intention outcome measured in this study. Although the additional improvement compared with the control group was modest, its educational significance lies in the feasibility of achieving greater willingness through an inexpensive and scalable training approach

suitable for schools and community youth programs

Implications and limitations

This study contributes to the scientific understanding that willingness to perform bystander CPR is an important outcome that is not automatically achieved through improvements in knowledge and skills alone. The findings demonstrate that low-cost CPR Pillow training can significantly increase adolescents' willingness to perform CPR, supporting behavioral theories that emphasize self-efficacy and perceived barriers in emergency response. These results suggest the need for future studies to include willingness as a key outcome when evaluating CPR education and to explore effective training approaches and supportive policies. However, the study has several limitations, including a relatively small sample consisting only of scout members from one city, which may limit generalizability. In addition, the quasi-experimental design, reliance on self-reported measures, and short follow-up period mean that actual CPR behavior and the long-term sustainability of increased willingness could not be assessed.

Relevance to Practice

This research shows that practitioners can use low-cost CPR Pillow-based training to deliver practical, scalable CPR education that directly increases adolescents' willingness to perform bystander CPR, even in settings with limited access to high-fidelity manikins. education and health authorities can advise low-cost simulation tools like CPR Pillow within school-based CPR requirements and include CPR Education in School curriculum.

Conclusion

CPR Pillow training can significantly increase adolescents' willingness to perform bystander CPR compared with classical leaflet-based training. Scout members who received CPR Pillow-based simulation showed a larger improvement in willingness scores than those who received only traditional teaching, indicating that hands-on, repeated practice is crucial to translate knowledge into a real intention to act in out-of-hospital cardiac arrest situations.

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CrediT Authorship Contributions Statement

Lukman Lukman: Conceptualization, Methodology, Supervision

Sapondra Wijaya: Validation, Formal Analysis, Writing - Review & Editing

Susmini Susmini: Resources, Data Curation, Project Administration

Wahyu Dwi Ari Wibowo: Review & Editing, Visualization, Funding Acquisition

Nurna Ningsih: Writing - Original Draft, Review & Editing

Bambang Soewito: Data Curation, Project Administration

Conflicts of Interest

There is no conflict of interest.

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