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Review

Public participation willingness in out-of-hospital cardiopulmonary resuscitation: A systematic review and meta-analysis

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ABSTRACT

Objective: This systematic review and meta-analysis aimed to identify the main factors influencing the public's willingness to participate in out-of-hospital emergency care.**Methods:** Studies were searched in online databases, including PubMed, Embase, Web of Science, and the Cochrane Library. The articles included in this review were published from inception to July 31, 2024. The Iain Crombie assessment tool was used to assess study quality. Meta-analysis was performed using RevMan (version 5.4) software. The review protocol has been registered with PROSPERO (CRD42024570491).**Results:** A total of 1,434 research articles were initially identified, among which 18 were incorporated into this study, and all of the included studies were cross-sectional. Meta-analysis results demonstrated that gender (male; $OR = 1.37$, 95% CI : 1.28–1.47), profession (healthcare provider; $OR = 0.17$, 95% CI : 0.06–0.47), knowledge and skill level ($OR = 1.63$, 95% CI : 1.25–2.11), willingness to undergo training ($OR = 2.68$, 95% CI : 1.89–3.79), interest in first aid ($OR = 2.08$, 95% CI : 1.60–2.69), previous training ($OR = 2.14$, 95% CI : 1.49–3.08), and previous first-aid experience ($OR = 1.70$, 95% CI : 1.37–2.11) were the principal influencing factors of the public's willingness to engage in out-of-hospital cardiopulmonary resuscitation.**Conclusion:** Demographic factors, knowledge, belief, and behavior are crucial in influencing public emergency decision-making. Medical personnel could create specialized training programs based on relevant factors to enhance the public's willingness to engage in out-of-hospital CPR.© 2025 The Authors. Published by Elsevier B.V. on behalf of the Chinese Nursing Association. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

What is known?

- Bystander cardiopulmonary resuscitation (CPR) is critical for improving survival rates in out-of-hospital cardiac arrests.
- The importance of public training and experience in CPR has been recognized.

What is new?

- This study synthesized the influence of demographic, knowledge, belief, and behavioral factors on CPR willingness.
- A meta-analysis confirming male gender, healthcare profession, and prior training as significant factors was conducted.

1. Introduction

Out-of-hospital cardiac arrest (OHCA) represents an emergency condition wherein the heart abruptly ceases to beat in a non-hospital environment, leading to the disruption of blood circulation and oxygen supply. OHCA has emerged as a significant public

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health concern globally [1,2]. The Emergency Medical Service has estimated that the annual total number of out-of-hospital cardiac arrests in China surpasses 750,000 [3]. This phenomenon incurs substantial losses to the nation, society, and families. The period of 4–6 min following cardiac arrest is regarded as the golden window for rescue. If cardiopulmonary resuscitation is not initiated promptly, brain cell damage in patients typically transpires within a few minutes, thereby significantly increasing patients' mortality rate [4,5]. Survivors of cardiac arrest who do not promptly receive cardiopulmonary resuscitation (CPR) may encounter long-term physical and cognitive disabilities that severely impinge upon their quality of life and independent working capacity [6]. A survey found that 80% of cardiac arrests predominantly transpired outside the hospital [7], and the arrival of professional medical personnel frequently exceeded the golden rescue time limit [8]. The timely and accurate implementation of emergency measures by the bystanders at the incident scene is crucial for enhancing the survival rate [9]. Given that the majority of emergency and severe diseases, as well as accidental injuries, typically occur in locations, such as communities and workplaces, that are distant from hospitals, the general public frequently constitutes the primary group responsible for providing immediate assistance. Hence, analyzing the factors influencing public first-aid behavior decision-making and investigating methods to augment public participation in first-aid decision-making is important to enhance social and economic benefits.

More studies have been conducted on public participation in OHCA in recent years. However, the findings regarding the influencing factors of such participation have not been entirely consistent, and a comprehensive and systematic synthesis and generalization are lacking. For instance, in contrast to Axelsson et al. [10], who posited that women may exhibit a lower propensity to perform CPR due to a deficiency in the requisite courage, Zhou et al. [11] discovered that women were more prone to conduct bystander CPR on strangers than men. Extant studies concentrated on specific populations or geographical regions [12–15], rendering it arduous to arrive at consistent conclusions. Additionally, the methodologies and outcomes of these studies vary, thus engendering confusion and ambiguity within the domain. Prior research conducted by Uny et al. [16] regarding the principal barriers to and facilitators of individual bystander CPR, it was revealed that individuals with lower levels of education or household income exhibited diminished confidence in performing CPR, particularly among residents of rural or poor areas. However, because of inadequate data, Uny et al. were precluded from conducting a meta-analysis. Smith et al. [17] demonstrated that antecedent training and experience significantly influenced the willingness of bystanders to partake in public access defibrillation (PAD) in the context of OHCA. However, they failed to conduct a meta-analysis to quantitatively summarize this finding, thereby diminishing the reliability of the results.

Accordingly, this research aimed to conduct a meta-analysis of the extant literature concerning the public's willingness to participate in out-of-hospital cardiopulmonary resuscitation (OH CPR), with the expectation of identifying the principal factors that influence public participation in OH CPR and simultaneously exploring the relationships between various demographic, attitudinal, and background factors and the willingness to perform cardiopulmonary resuscitation. This research could provide evidence-based recommendations for policymakers, healthcare providers, and educators, laying a solid foundation for public participation in OH CPR.

2. Methods

This research project was represented a systematic review and

meta-analysis, and followed the PRISMA statement (2020). The review protocol has been registered on the PROSPERO website (CRD42024570491).

2.1. Search strategy

Subject headings and free-text terms were employed to conduct searches within the PubMed, Embase, Web of Science, and the Cochrane Library. This systematic review encompassed all full-text English-language articles published in peer-reviewed journals without any restrictions regarding publication dates. Neither summaries nor reports of conference proceedings were included. The search terms utilized were as follows: “cardiopulmonary resuscitation,” “willingness,” “factors.” We searched the databases from inception to July 31, 2024. The information on the search strategy is in [Appendix A](#). The list of references for the included studies and related review articles was manually searched to identify other eligible studies that may have been overlooked during the initial search. A detailed search plan was formulated and documented before the search's commencement to guarantee the search's comprehensiveness and repeatability. Searches were not constrained by publication status to mitigate the risk of publication bias. All the retrieved articles were imported into EndNote literature management software for preliminary selection based on title and abstract. The full text was read for articles with uncertain eligibility, and the established inclusion and exclusion criteria were further applied to assess their eligibility.

2.2. Inclusion and exclusion criteria

The inclusion criteria were as follows: 1) study participants being the general public, including both healthcare and non-healthcare professionals; 2) focus on factors related to willingness to perform emergency care; 3) cohort and cross-sectional studies; and 4) with adjusted odds ratios (ORs) with 95% confidence intervals (CIs) from multivariate analysis or data that can be converted into OR, 95%CI, and standard errors. The exclusion criteria were as follows: 1) non-English literature, 2) data information either not detailed or the full text being unobtainable, and 3) repeated publications.

2.3. Study selection process and data extraction

Two researchers (Y. Cheng and C. Zhang) conducted a thorough literature search across four major databases to identify studies on public willingness to perform OH CPR. They independently reviewed the titles and abstracts of the studies using predefined criteria to assess eligibility. The full-text articles of studies deemed potentially eligible were examined for final inclusion. Disagreements between the researchers were resolved through discussions or consultation with a third party. A summary table was developed to capture key details of the included studies, such as authors, publication year, location, language, study design, sample size, characteristics, measures of public willingness, influencing factors, and outcomes. The extracted data were cross-verified by both researchers to ensure the reliability and validity of the data.

2.4. Quality appraisal

This systematic review and meta-analysis evaluated the quality of the included studies using the Iain Crombie assessment tool [18]. This tool was selected for its thorough and effective evaluation of research methods' rigor and potential biases in OH CPR. It assesses studies based on seven criteria: 1) scientific study design, 2) reasonable data collection strategy, 3) response rate of the sample,

4) representativeness of the sample to the general population, 5) rationale of research objectives and methods, 6) reporting of trial efficiency, and 7) appropriateness of statistical methods. Each criterion is rated as “yes,” “no,” or “unclear,” with scores of 1, 0, or 0.5, respectively. The total score ranges from 0 to 7, with grades A (6 or 7 points), B (4–5.5 points), and C (below 4 points). Two authors (Y. Cheng and C. Zhang) independently assessed each study to ensure objectivity and consistency. Disagreements were resolved by discussing with a third researcher (L. Chen) to make the final decision on inclusion.

2.5. Data analysis

Data analysis was conducted utilizing RevMan (version 5.4) software. The OR value and 95%CI within the literature were selected for data consolidation, and heterogeneity was ascertained via I^2 . If $P \geq 0.10$ and $I^2 \leq 50\%$, the heterogeneity among the literature sources was deemed small, and the fixed-effect model was employed. If $P < 0.10$ and $I^2 > 50\%$, the heterogeneity among the literature sources was considered large, and a random-effect model was utilized. Sensitivity, subgroup, or descriptive analyses were conducted for the indicators exhibiting evident heterogeneity. A funnel plot was employed to depict publication bias for the influential factors with 10 or more included studies [19]. $P < 0.05$ was regarded as statistically significant.

3. Results

3.1. Selection of included studies

The literature search retrieved 1,821 research articles from electronic databases and search engines. Subsequently, 18 research articles met the inclusion criteria and were integrated into the quantitative synthesis, as illustrated in Fig. 1. All the included studies employed a cross-sectional design. The study by Hasegawa and Hanaki [20], which encompasses three distinct student groups, namely, junior high, high school, and university, was divided into three sub-studies (1–3) for comprehensive analysis. The fundamental characteristics of the included studies are showcased in Appendix B.

3.2. Methodological quality of included studies

All studies were correctly targeted to the intended populations, and participants were measured reliably. Among these studies, 15 were classified as grade A and three as grade B, as detailed in Table 1.

3.3. Factors associated with public first-aid willingness

A comprehensive review of 18 studies showed many factors related to the public's willingness to engage in OHCA first aid. These factors were categorized into four groups: demographics, knowledge, beliefs, and behavior. Demographics included gender and profession, knowledge encompasses knowledge and skill level, beliefs cover willingness to undergo training and interest in first aid, and behavior involves previous training and first-aid experience.

3.3.1. Demographics

Gender (male). Gender is a significant personal factor influencing the willingness to perform first aid. A meta-analysis encompassing 10 studies [13,20,22,24–26,28,29,31,32] disclosed that males are correlated with the willingness to engage in first aid, presenting an OR of 1.37 (95%CI: 1.28–1.46). As Appendix C depicts, no clinically significant heterogeneity was observed ($I^2 = 31\%$, $P < 0.001$).

Profession (healthcare provider). The profession was determined to correlate with the willingness to perform first aid. Specifically, two articles [24,25] reported on healthcare providers' desire, and no statistical heterogeneity was present in the studies ($I^2 = 0\%$, $P = 0.420$). Employing the fixed-effect model, the meta-analysis revealed that healthcare providers were less willing to conduct first aid (OR = 0.17, 95%CI: 0.06–0.47, $Z = 3.36$, $P < 0.001$), as depicted in Appendix D.

3.3.2. Knowledge

Knowledge and skill level. Seven articles [11,14,20,21,28,30,32] reported the influence of knowledge level on the intention to perform first aid, and the studies exhibited statistical heterogeneity ($I^2 = 65\%$, $P = 0.004$). Employing the random-effect model, the meta-analysis statistics revealed that individuals possessing first-aid knowledge are more inclined to carry out on-site first aid (OR = 1.63, 95%CI: 1.25–2.11, $Z = 3.36$, $P < 0.001$), as depicted in Appendix E.

3.3.3. Beliefs

Willingness to undergo training. Three articles [21,24,25] reported on the public's inclination to participate in first-aid training, and no statistical heterogeneity was present within the studies ($I^2 = 0\%$, $P = 0.77$). By employing the fixed-effect model, the meta-analysis statistics demonstrated that individuals who were inclined to participate in first-aid training were more disposed to conduct on-site first aid (OR = 2.68, 95%CI: 1.89–3.79, $Z = 5.56$, $P < 0.001$), as depicted in Appendix F.

Interest in first aid. Five articles [14,20,24,27,30] reported on individuals who positively evaluated first aid, and no statistical heterogeneity was evident in the studies ($I^2 = 26\%$, $P = 0.23$). By employing the fixed-effect model, the meta-analysis statistics revealed that individuals with a positive evaluation of first aid were more inclined to perform on-site first aid (OR = 2.08, 95%CI: 1.60–2.69, $Z = 5.55$, $P < 0.001$), as depicted in Appendix G.

3.3.4. Behavior

Previous training. Eight articles [12,13,21–23,27,28,32] reported on the impact of training experience on the willingness to perform first aid, and the studies exhibited statistical heterogeneity ($I^2 = 90\%$, $P < 0.001$). Employing the random-effect model, the meta-analysis statistics revealed that individuals with training experience were more inclined to conduct on-site first aid (OR = 2.14, 95%CI: 1.49–3.08, $Z = 4.12$, $P < 0.001$), as depicted in Appendix H.

Previous first-aid experience. Five articles [12,20,27,31,32] reported the first-aid willingness of individuals with first-aid expertise, and the studies exhibited statistical homogeneity ($I^2 = 9\%$, $P = 0.36$). Employing the fixed-effect model, the meta-analysis revealed that individuals with first-aid experience were more inclined to conduct on-site first aid than others (OR = 1.70, 95%CI: 1.37–2.11, $Z = 4.77$, $P < 0.001$), as depicted in Appendix I.

3.4. Source of heterogeneity and sensitivity analysis

Within this study, two influencing factors exhibiting high heterogeneity were identified: knowledge and skill level (with seven included literature, $I^2 = 65\%$, $P = 0.004$) and previous training (with eight included literature studies, $I^2 = 90\%$, $P < 0.001$). The sampling methods included in the literature, the economic level, the geographic position, the questionnaire collection methods, the reliability and validity of the research tools, and the sources of the questionnaires were extracted. Subsequently, the sources of heterogeneity for the above two influencing factors were analyzed. The results are presented as follows.

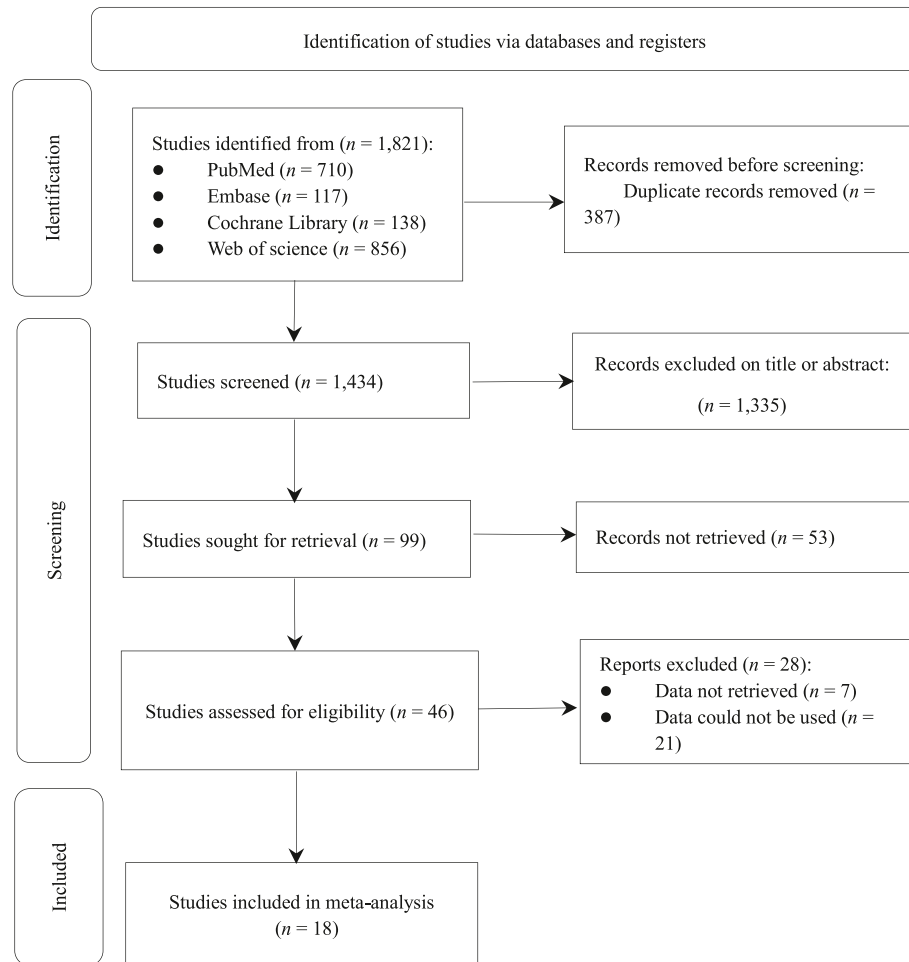


Fig. 1. Flow chart of study selection.

Table 1
Quality appraisal of included studies.

Studies	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Total score	Grade
Birkun and Kosova, 2018 [21]	1	1	1	1	1	0.5	1	6.5	A
Chaou et al., 2016 [22]	1	1	1	0.5	1	0.5	1	6	A
Enami et al., 2010 [23]	1	1	0.5	0.5	1	0.5	1	5.5	B
Hasegawa and Hanaki, 2023 [14]	1	1	1	1	1	0.5	1	6.5	A
Hasegawa and Hanaki, 2023 [20]	1	1	1	0.5	1	0.5	1	6	A
Hawkes et al., 2019 [12]	1	1	0.5	1	1	0.5	1	6	A
Huang et al., 2019 [24]	1	1	0.5	1	1	0.5	1	6	A
Huang et al., 2021 [25]	1	1	0.5	1	1	0.5	1	6	A
Johnston et al., 2003 [26]	1	1	0.5	1	1	0.5	1	6	A
Kuramoto et al., 2008 [27]	1	1	1	1	1	0.5	1	6.5	A
Lee et al., 2021 [28]	1	1	0.5	1	1	0.5	1	6	A
Omi et al., 2008 [29]	1	1	1	0.5	1	0.5	1	6	A
Riccò et al., 2020 [30]	1	1	1	0.5	1	0.5	1	6	A
Savastano and Vanni, 2011 [31]	1	1	0.5	0.5	1	0.5	1	5.5	B
Zhou et al., 2019 [11]	1	1	1	1	1	0.5	1	6.5	A
Kusumawati et al., 2023 [32]	1	1	0.5	0.5	1	0.5	1	5.5	B
Cheskes et al., 2016 [13]	1	1	0.5	1	1	0.5	1	6	A
Enami et al., 2011 [33]	1	1	0.5	1	1	0.5	1	6	A

Note: Q1: Design science. Q2: The data collection strategy is reasonable. Q3: Sample response rates are reported. Q4: The sample is representative of the population. Q5: Rationale of re-search objectives and methods. Q6: The effectiveness of the test was reported. Q7: Reasonable statistical method.

3.4.1. Knowledge and skill level

Six subgroup analyses were performed on this factor, but none of them could reduce the heterogeneity within the study. The specific analysis results are presented in Appendix J. Sensitivity

analysis was conducted by excluding the references individually. Following the exclusion of the study by Kusumawati et al. [32], no statistical heterogeneity was observed among the other six studies ($I^2 = 27\%$, $P = 0.21$). A minimal difference was found between the

results of the random and fixed-effect models, indicating that the results possess good stability (good sensitivity), as depicted in Appendix K. In contrast to other research analyses, this study recruited participants via cluster random sampling and utilized questionnaires from other countries after localization and debugging.

3.4.2. Previous training

After the subgroup analysis of this factor, the heterogeneity remained unabated, and the specific analysis results are presented in Appendix L. Sensitivity analysis was conducted by excluding articles one by one. Following the exclusion of the article by Hawkes et al. [12], no statistical heterogeneity was observed among the other seven studies ($I^2 = 46\%$, $P = 0.08$). A minimal difference was observed between the results of the random and fixed-effect models, indicating that the results are stable (sensitive), as depicted in Appendix M. The distinction between this paper and other papers lies in the fact that the former utilized a general questionnaire designed by the YouGov platform to conduct the survey, whereas in other studies [21,23,27,28], either the questionnaires designed by the authors or those designed by others were localized [13,22,32] and then applied.

3.5. Analysis of publication bias

Gender (male) was utilized for funnel plot analysis. The outcomes indicated that the left and right sides of the funnel plot were not entirely symmetrical, implying the potential existence of some publication bias (Appendix N).

4. Discussion

Elucidating the influencing factors that impact the public's propensity to participate in OH CPR is crucial for enhancing the quality and efficiency of OH CPR, thereby saving patients' lives or ameliorating their prognosis. A pooled analysis of 18 studies conducted in seven countries identified that the factors influencing the public's propensity to participate in OH CPR encompassed gender, occupation, knowledge and skill level, willingness to undergo first-aid training, perception of first aid, training experience, and first aid experience.

The study findings revealed significant gender differences in willingness to perform first aid, with men demonstrating higher willingness than women, consistent with previous research [24]. Psychological and social factors may partly explain these differences. Previous study suggested that women may exhibit a lower willingness to perform CPR due to a perceived lack of courage [10]. Some studies indicated that women were more reluctant than men to perform mouth-to-mouth ventilation, which may pose another barrier to their engagement in CPR [34,35]. Early data showed that men were 2.5 times more likely than women to perform basic life support in cases of cardiac arrest (95%CI: 1.9–3.3) [36]. Psychological analysis suggests that men typically exhibit more logical and courageous traits, whereas women tend to avoid conflict and prefer sensitive emotional responses [37]. The Global Gender Gap Report highlighted significant gender equality gaps in some societies [27,29]. Therefore, educators and healthcare professionals should know these gender differences [38–40].

Healthcare providers showed a lower willingness to give first aid. This phenomenon has not been thoroughly explored in previous literature. Previous research suggests that professionals and the general public achieve comparable outcomes using a bystander automated external defibrillator (AED). However, healthcare providers possess superior knowledge and resuscitation skills. One potential explanation is the possible legal complications. Having

received standardized resuscitation training, they may fear liability for adverse outcomes [24,25]. Further investigation is warranted to explore this negative attitude among healthcare providers towards first aid in greater detail. Future studies could examine how various professional backgrounds influence the willingness to perform first aid and consider developing targeted training programs to enhance public participation in first aid.

Multiple factors influence the willingness of individuals to administer first aid during emergencies. Notably, those with greater knowledge are more likely to administer first aid. The findings align with existing literature, indicating that a lack of first-aid knowledge and insufficient skill confidence are significant barriers to performing CPR [41]. Chen et al. [42] reported that 20.8% of civil servants possessed advanced knowledge in cardiopulmonary resuscitation. Subsequent surveys indicated that over 80% of bystanders were uncertain about appropriate actions during emergencies due to insufficient basic life support (BLS) knowledge and skills [43]. Furthermore, 67%–80% of respondents viewed the deficiency in knowledge and confidence as a substantial impediment to offering assistance [44–46]. The social psychology perspective underscores the importance of possessing the requisite ability and experience to execute BLS as a pivotal element in stimulating actual individual actions. Individuals with pertinent skills and a history of successful interventions are more prone to administer CPR during emergencies [39,45–49] effectively. Educational attainment is highly correlated with the propensity to conduct CPR, with those with advanced education exhibiting greater willingness to provide such aid in emergencies [27,50].

Those who desired to participate in first-aid training were more likely to provide first aid when faced with an emergency. In a previous survey, approximately 80% of respondents indicated they would spend 1 h attending a first-aid training course [24]. Studies on video training in teaching AED operation showed remarkable results [51]. Another study found that a combination of 2 h of AED and CPR training was appropriate [52], and a shorter timeframe for CPR skill training was effective [53]. Therefore, video training to teach AED skills can reduce the total duration of CPR and AED courses to 1 h and effectively increase the public's willingness to participate in training. Another study showed that participants were strongly interested in free AED training sessions [25]. They generally agree that the public must learn how to use AEDs, and this belief is positively correlated with bystanders' willingness to use AEDs. These findings are consistent with the present study's findings on attitudes to first-aid training and further emphasize the importance of improving the public's first-aid capabilities.

Interest in first aid is crucial to increase the public's willingness to perform first aid. Research has shown that individuals' increased interest in BLS directly contributed to their willingness to implement BLS actions. In particular, by attending BLS workshops, the participants' interest increased significantly, enhancing their willingness to take action in real first-aid situations [47]. Seminars are effective strategies to stimulate interest in individuals who would otherwise be less interested in BLS [54], and the growth of this interest may be closely linked to the individual's continuing education and career development. Although the current research on changes in interest over time after BLS seminars is relatively few, cultivating such interest is considered an effective method to increase the willingness to implement BLS. Another study [20] pointed out that young people were particularly eager to learn knowledge that could be practical in the future. Therefore, incorporating knowledge of the BLS program into the qualification system can considerably increase their interest in BLS. Although this interest may be temporary, it provides an effective framework for increasing the willingness to implement BLS.

People with first-aid training are more willing to administer first

aid in emergencies. Numerous studies[38–40] consistently found that experience with BLS training is an independent factor in promoting an individual's willingness to perform CPR actively. Other studies have shown that the willingness to perform CPR in individuals who have received CPR training increased with the number of training sessions[26,27,35,36,50,55–57]. In particular, recently trained individuals showed a higher willingness to try CPR when faced with a loved one or stranger who needed it [26,35,36,50,56,57]. This finding indicated that first-aid training for the public is necessary. Through simulation training, the public can enhance their belief in implementing first aid and help them to accurately rescue when they encounter similar situations in a future life, thus improving their rescue ability and winning valuable first-aid time for professional first responders, which can produce huge social benefits.

Individuals with actual first-aid experience are more likely to help others in an emergency. This trend may stem from the positive influence of individual experience on the perception of behavioral control, especially among those with experience performing CPR who are more proficient in the knowledge and skills of CPR [42]. Most people who have participated in CPR consider it a positive experience and express a willingness to help again in the future [58]. These findings are consistent with previous research, which showed that people with actual BLS experience were more likely to apply BLS skills [22]. First-aid experience is a strong predictor, significantly affecting individuals' first-aid intentions [59]. However, a notable detail is that first-aid experience is highly personal, and individuals may have vastly different positive and negative experiences. For example, administering first aid in a stressful situation may lead to feelings of fear or frustration. Moreover, given that not all people have the opportunity to administer first aid, the experience itself is relatively rare [60]. Current research has not fully explored the specific effect of first-aid experience on behavioral intention, thus providing a new research direction for future research.

Certain limitations of this study merit discussion. First, the substantial heterogeneity exhibited by the included studies with regard to “knowledge and skill level” and “previous training” undermined the reliability of the meta-analysis outcomes to a certain extent. Heterogeneity persisted even when subgroup analysis was conducted on the sampling method, survey region, location distribution, questionnaire collection method, reliability and validity of research tools, and the source of the questionnaire. Sensitivity analysis and an in-depth examination of the included studies ascertained that the principal source of heterogeneity in relation to “knowledge and skill level” was the cluster random sampling employed in the study by Kusumawati et al. [32], which differed significantly from other included studies. Cluster random sampling has the potential to result in a poorly representative population, substantial sampling errors, and an uneven sample distribution. Consequently, heterogeneity is inescapable. About the heterogeneity of “previous training,” Hawkes et al. [12] utilized the general questionnaire designed by the YouGov platform to conduct a survey. Meanwhile, the questionnaires of other studies were either designed by the researchers themselves or were localized questionnaires designed by others. Discrepancies in questionnaire design constitute an important source of heterogeneity in “previous training.” Furthermore, the exclusive inclusion of English articles in this study may have led to language bias. Factors such as health status, marital status, and residence area influenced the public's willingness to engage in first aid. However, a meta-analysis could not be done due to insufficient literature data. In addition, the asymmetrical funnel plot implied the potential existence of publication bias. Consequently, the subject matter still requires in-depth study through cross-sectional surveys with an adequate sample

size. Finally, this analysis focused primarily on single-factor analyses to assess the effect of various factors on the public's willingness to perform OH CPR. However, single-factor analysis may not fully capture complex interactions between multiple factors. For example, gender, occupation, knowledge and skill level, training willingness, interest in first aid, training experience, first aid experience, and other factors can interact to determine the public's first-aid willingness jointly. Due to the lack of multifactor adjustment data, the interaction between these factors and their combined effect on first-aid intent was not accurately assessed. Therefore, future studies should consider the use of multifactor analysis to more comprehensively assess the factors influencing the public's willingness first to aid and their interrelationships to help provide stronger evidence support for policymakers, healthcare providers, and educators and more effectively increase the willingness and capacity of the public to participate in first aid.

5. Conclusions

A pooled analysis of 63,199 participants across 18 studies revealed that gender, profession, knowledge and skill level, willingness to undergo training, interest in first aid, previous training, and previous first-aid experience are key factors influencing the public's decision regarding first aid. However, in light of the paucity of studies within the current field and the restricted quality of evidence, further exploration must still be conducted through additional cross-sectional investigations characterized by high quality and large sample sizes.

CRedit authorship contribution statement

Yuqiu Cheng: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Data curation, Writing – original draft, Writing – review & editing, Project administration. **Chunzhi Zhang:** Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Data curation, Writing – review & editing, Supervision, Project administration. **Li Chen:** Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Data curation, Writing – review & editing. **Hongjun Liu:** Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Writing – review & editing. **Wanling He:** Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Writing – review & editing. **Zeya Shi:** Conceptualization, Methodology, Validation, Formal analysis, Funding acquisition, Writing – review & editing, Supervision, Project administration.

Data availability statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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Declaration of competing interest

The authors declare that there are no conflicts of interest regarding the publication of this paper. We confirm that we do not

have any financial or personal relationships with other people or organizations that could inappropriately influence (bias) our work presented in this manuscript.

Appendices. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijnss.2025.02.012>.

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