CPR knowledge and attitudes among physical education students at universities in Indonesia and China: A cross-sectional comparative study

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ABSTRACT

Background: Immediate bystander cardiopulmonary resuscitation (CPR) is critical following sudden cardiac arrest. Physical education (PE) students, as future teachers and coaches, may be responsible for responding to such emergencies.

Objective: To compare CPR knowledge and attitudes among PE students in Indonesia and China and examine their association.

Methods: This cross-sectional comparative study involved one university in each country and used nonprobability convenience sampling. All 30 Indonesian respondents were included; 30 of 108 Chinese respondents were selected for demographic comparability in sex, age, and semester, independently of CPR scores. A questionnaire comprising nine knowledge and 12 attitude items was administered. Group differences were assessed using the Mann–Whitney U test with rank-biserial effect sizes, and associations were examined using Spearman's correlation.

Results: Knowledge scores did not differ significantly between Chinese and Indonesian students (median [IQR]: 6 [5–7] vs. 5 [4–8]; U = 466, p = .817, r = .04). Attitude scores also showed no significant difference (3.21 [2.69–3.33] vs. 3.17 [2.77–3.42]; U = 400, p = .463, r = -.11). Knowledge and attitudes were weakly but positively correlated (ρ = .286, p = .027).

Conclusion: No statistically significant differences in CPR knowledge or attitudes were detected between the participating universities. However, the small, nonrandom sample limits generalizability and does not establish equivalence. Structured, practice-based CPR training warrants consideration in PE curricula.

Keywords: attitude, cardiopulmonary resuscitation, cross-sectional study, knowledge, physical education students.

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INTRODUCTION

Sudden cardiac arrest (SCA) is a life-threatening medical emergency associated with high mortality, particularly when timely intervention is unavailable. Survival rates following out-of-hospital cardiac arrest (OHCA) remain low, often falling below 10% in settings where prompt and appropriate treatment is lacking (Pacific, 2024). SCA can occur unexpectedly in various settings, including during sports participation. A notable incident occurred at the 2024 Asian Junior Badminton Championships in Indonesia, where a 17-year-old Chinese badminton player suffered a fatal cardiac arrest during competition (Pacific, 2024). This incident highlights the importance of emergency preparedness and the ability to provide basic life support, particularly cardiopulmonary resuscitation (CPR), in sports and physical education settings in both Indonesia and China.

Immediate CPR performed by bystanders has been shown to substantially improve survival following OHCA. Nevertheless, bystander CPR rates remain relatively low in many countries, including China. Data from China's national OHCA registry indicate that approximately 20.3% of patients receive bystander CPR, considerably lower than the rates exceeding 40% reported in some high-income countries (Pacific, 2024). In Indonesia, challenges in prehospital OHCA management have also been documented, particularly in primary healthcare facilities and rural communities (Sasmito et al., 2024). These challenges highlight the importance of improving public knowledge, confidence, and preparedness to respond to cardiac emergencies, including among university students who may encounter such situations in their future professional roles.

Physical education (PE) students represent an important population in this context. As prospective PE teachers, coaches, and sports professionals, they may be responsible for ensuring the safety of students and athletes during physical activity, including responding to life-threatening emergencies such as SCA (González-Moret et al., 2025). Although SCA among athletes is relatively uncommon, its consequences can be fatal without immediate intervention. A review of SCA in athletes emphasized the importance of emergency action plans (EAPs), including CPR training and access to automated external defibrillators (AEDs), to strengthen emergency preparedness among coaches, educators, and other sports personnel (Malik et al., 2023). Accordingly, CPR knowledge and practical skills should be regarded as essential competencies for future PE professionals rather than merely supplementary aspects of their education.

Previous studies have reported considerable variation in CPR knowledge and attitudes among university students, with knowledge levels frequently remaining inadequate. A study involving PE students in Jordan found low levels of CPR knowledge regardless of previous training experience, although attitudes toward CPR were generally positive, particularly among students who had received training (Manaseer et al., 2025). Similarly, a survey of university students in Chongqing, China, reported a mean CPR knowledge score of only 2.078 out of nine, accompanied by limited willingness to participate in CPR training (Mao et al., 2021). Studies involving first-year university students in Xuzhou and Wuhu, China, have also identified gaps in CPR-related knowledge, attitudes, and practices, with previous training and self-efficacy emerging as relevant factors (Qin et al., 2024; Yang et al., 2025). Comparable concerns have been reported among medical students at Najran

University, Saudi Arabia, where CPR knowledge and willingness to intervene varied according to academic year and previous clinical training exposure (Aedh et al., 2025). Collectively, these findings suggest that limitations in CPR knowledge and preparedness extend across academic disciplines and educational contexts.

Beyond examining CPR knowledge and attitudes independently, understanding their relationship is important for developing effective educational strategies. Previous research has identified positive associations between CPR knowledge and attitudes or behavioral intentions, although the strength of these relationships varies (Wei et al., 2025). Drawing on the Theory of Planned Behavior, Wei et al. (2025) found that CPR knowledge was a weaker predictor of behavioral intention than attitudes and subjective norms among Chinese university freshmen. This suggests that improving knowledge alone may not necessarily produce corresponding improvements in attitudes or willingness to intervene. Conversely, research involving professional football players and coaches demonstrated that structured CPR training significantly improved both knowledge and attitudes (González-Moret et al., 2025). Demographic characteristics may also influence CPR-related behaviors. For example, an international scoping review identified sex-related disparities in the provision and receipt of bystander CPR, with concerns surrounding physical contact and social perceptions contributing to these differences (Blewer et al., 2024). These findings underscore the importance of considering both educational experiences and demographic characteristics when examining CPR knowledge and attitudes.

Despite growing attention to CPR education, research focusing specifically on PE students remains limited. Existing studies have predominantly examined medical and health sciences students or other general university populations (Aedh et al., 2025; Bilal et al., 2024; Mercuri et al., 2026). Evidence from PE and sports settings nevertheless indicates persistent shortcomings in emergency preparedness. In Norway, Bakke et al. (2017) reported that only 64% of surveyed PE and vocational teachers taught CPR, identifying insufficient curricular guidance, competing educational priorities, limited access to training manikins, and inadequate instructor preparation as major barriers. Similarly, studies involving coaches and school athletic programs in the United States have documented inconsistencies in EAP implementation, AED availability, and CPR training requirements (Hedberg et al., 2025; Mason et al., 2022; Post et al., 2019). Research involving preservice PE teachers has further highlighted the need for additional first-aid education, including CPR training and practical workshops (Mendoza et al., 2023). Although these studies provide valuable insights into CPR-related preparedness, most have been conducted within individual countries or specific professional groups. Direct cross-national comparisons of CPR knowledge and attitudes among PE students, particularly between Indonesia and China, remain scarce.

Addressing this gap, the present study aimed to compare CPR knowledge and attitudes among PE students at selected universities in Indonesia and China and to examine the association between these variables. By providing cross-national comparative evidence, this study seeks to identify potential similarities and differences in CPR-related knowledge and attitudes and to inform the development of more structured, practice-based CPR education within PE curricula.

METHODS

Study Design and Participants

This study employed a cross-sectional comparative design to examine differences in cardiopulmonary resuscitation (CPR) knowledge and attitudes between physical education (PE) students in Indonesia and China. The association between CPR knowledge and attitudes was also examined using the combined sample from both countries.

A total of 60 PE students participated in the analysis, comprising 30 students from one university in Indonesia and 30 from one university in China. Participants were initially recruited through nonprobability convenience sampling based on their availability and willingness to participate. Data were collected using an online questionnaire between April 22 and 28, 2026, in China and between April 30 and May 12, 2026, in Indonesia.

The initial sample comprised 108 respondents from China and 30 from Indonesia. All Indonesian respondents were retained, whereas 30 Chinese respondents were selected to create a subsample comparable to the Indonesian group in terms of sex, age, and academic semester. This demographic matching procedure was conducted independently of CPR knowledge and attitude scores to avoid outcome-based selection. Consequently, 78 Chinese respondents (72.2%) were excluded from the comparative analysis solely because of subsample selection rather than incomplete responses.

Participant characteristics are presented in Table 2. Both groups had identical sex distributions, with 19 male and 11 female students in each group, and most participants were aged 18–20 years. The demographic matching procedure was intended to improve comparability between the two groups.

Ethical approval statement

The Research Ethics Committee of Universitas Negeri Malang, Indonesia, issued an institutional review board statement (Reference No. 10.11.2/UN32.14/PB/2026, dated November 10, 2026) concerning this study. The committee confirmed that undergraduate students participating in the research are considered adults under Indonesian regulations; therefore, parental or legal guardian permission is not required for these participants.

Research Instruments

CPR knowledge and attitudes were assessed using the CPR Knowledge and Attitude Assessment Tool, developed by the authors and administered to both groups. The original Indonesian version was used for Indonesian participants, while a Mandarin version was prepared using an online translation tool. No formal forward–backward translation procedure was undertaken, and measurement equivalence between the language versions was not established.

The instrument comprised nine knowledge items and 12 attitude items (Table 1). The knowledge items assessed understanding of fundamental CPR principles, including recognition of situations requiring CPR, initial assessment, the compression-to-ventilation ratio, chest compression rate and depth, chest recoil, and characteristics of high-quality chest compressions. Each correct response was

assigned one point, while incorrect responses received zero points, yielding a total score ranging from 0 to 9. Higher scores indicated greater CPR knowledge.

The attitude section consisted of 12 statements rated on a four-point Likert scale. Negatively worded items were reverse-scored before calculating the overall attitude score. The final score was calculated as the mean of the 12 items, ranging from 1 to 4, with higher scores indicating more positive attitudes toward CPR.

The instrument comprised nine knowledge items and 12 attitude items. The knowledge items were scored dichotomously, whereas the attitude items were assessed using a four-point Likert scale. A detailed description of the instrument items, measurement scales, and scoring procedures is provided in Table 1.

The instrument did not undergo formal content validation or pilot testing, and cross-language measurement equivalence was not assessed. Internal consistency was evaluated separately for each group. For the knowledge subscale, the Kuder–Richardson Formula 20 (KR-20) coefficients were 0.633 for the Chinese group and 0.700 for the Indonesian group. For the attitude subscale, Cronbach's alpha coefficients were 0.771 and 0.785, respectively. These findings indicate modest internal consistency for the knowledge subscale, particularly among Chinese participants, warranting caution when interpreting the knowledge scores.

Table 1. Items and scoring procedures for the CPR knowledge and attitude assessment instrument

Variable	No.	Indicator/Item	Measurement Scale	Scoring
Knowledge	K1	First action upon finding an unresponsive adult	Multiple choice	Correct = 1; Incorrect = 0
	K2	Initial principle of CPR administration	Multiple choice	Correct = 1; Incorrect = 0
	K3	Chest compression-to-ventilation ratio in adults	Multiple choice	Correct = 1; Incorrect = 0
	K4	Chest compression rate per minute	Multiple choice	Correct = 1; Incorrect = 0
	K5	Chest recoil after compression	Multiple choice	Correct = 1; Incorrect = 0
	K6	Chest compression depth in adults	Multiple choice	Correct = 1; Incorrect = 0
	K7	Characteristics of effective chest compression	Multiple choice	Correct = 1; Incorrect = 0
	K8	Maximum time to begin compression once CPR is indicated	Multiple choice	Correct = 1; Incorrect = 0
	K9	Loss of consciousness as a possible sign requiring CPR	Yes/No	Correct = 1; Incorrect = 0
Attitude	A1	Willingness to give rescue breaths to a stranger	Likert 1–4	Item-direction scored
	A2	Willingness to give rescue breaths to a family member	Likert 1–4	Item-direction scored
	A3	Willingness to give rescue breaths to the opposite sex	Likert 1–4	Item-direction scored

Table 1. Continued

Variable	No.	Indicator/Item	Measurement Scale	Scoring
	A4	Reluctance to give rescue breaths due to infection fear	Likert 1–4	Reverse scoring
	A5	Willingness to give rescue breaths to children	Likert 1–4	Item-direction scored
	A6	Reluctance to perform chest compression due to infection fear	Likert 1–4	Reverse scoring
	A7	Willingness to perform chest compression on a family member	Likert 1–4	Item-direction scored
	A8	Willingness to perform chest compression on a stranger	Likert 1–4	Item-direction scored
	A9	Perception that CPR is dangerous to perform	Likert 1–4	Reverse scoring
	A10	Interest in learning and practicing CPR	Likert 1–4	Item-direction scored
	A11	Compatibility of CPR with cultural and religious values	Likert 1–4	Item-direction scored
	A12	Perception that CPR is important and can save lives	Likert 1–4	Item-direction scored

Data Analysis

Data were analyzed using IBM SPSS Statistics. Descriptive statistics, including means, standard deviations, medians, interquartile ranges (IQRs), and minimum and maximum values, were calculated to summarize CPR knowledge and attitude scores in each group. The Shapiro–Wilk test was used to assess normality. Because knowledge scores in the Indonesian group deviated significantly from a normal distribution ($p = .047$), the nonparametric Mann–Whitney U test was applied to compare both knowledge and attitude scores between countries, ensuring a consistent analytical approach. Medians and IQRs were used as the primary descriptive measures, while means and standard deviations were reported as supplementary information. Between-group effect sizes were calculated using the rank-biserial correlation, expressed as $r = 2U/(n_1 \times n_2) - 1$, where U represents the Mann–Whitney statistic for the Chinese group and n_1 and n_2 represent the respective group sizes. Values range from -1 to 1, with positive values indicating higher scores among Chinese participants. Absolute values below 0.10 were considered negligible, while values of approximately 0.10, 0.30, and 0.50 were interpreted as small, moderate, and large effects, respectively, using conventional correlation effect-size benchmarks (Cohen, 1988). Although the Chinese subsample was selected to achieve demographic comparability, the matching procedure did not establish individually linked participant pairs. Accordingly, the Mann–Whitney U test for independent samples was considered appropriate rather than a paired-sample test.

The association between CPR knowledge and attitudes was examined using Spearman's rank correlation coefficient (ρ) in the combined sample ($n = 60$). Correlation coefficients with absolute values below 0.30 were interpreted as weak, values between 0.30 and 0.49 as moderate, and values of 0.50 or higher as strong. Statistical significance was set at $p < .05$.

No validated or predefined thresholds were used to categorize knowledge or attitude scores as low, moderate, or high. Instead, scores were reported numerically or as percentages of their respective maximum possible values. Furthermore, because the study was not designed to establish equivalence, nonsignificant between-group differences were not interpreted as evidence of equivalent CPR knowledge or attitudes.

RESULTS

Participant Characteristics

Participant characteristics are presented in Table 2. Both groups had identical sex distributions, with 19 male and 11 female students in each group, and most participants were aged 18–20 years. The demographic matching procedure was intended to improve comparability between the two groups.

Table 2. Characteristics of the Participants

Characteristic	Indonesia (n = 30)	China, matched subsample (n = 30)	China, all respondents (n = 108)
Sex, n (%)			
Male	19 (63.3)	19 (63.3)	75 (69.4)
Female	11 (36.7)	11 (36.7)	33 (30.6)
Age, years, median (range)	19 (17–21)	19 (18–21)	19 (18–23)
Aged 18–20 years, n (%)	28 (93.3)	29 (96.7)	73 (67.6)
Semester, median	2	2	2

Note: The semester range is not reported for all Chinese respondents because one response was recorded in the category “>8”.

Descriptive Statistics and Normality Assessment

Table 3 presents the descriptive statistics for CPR knowledge and attitude scores among Chinese and Indonesian physical education students. The mean CPR knowledge scores were comparable between the Chinese (5.87 ± 2.13) and Indonesian (5.83 ± 2.31) groups, with both groups achieving scores ranging from 1 to 9. For CPR attitudes, Indonesian students had a slightly higher mean score (3.11 ± 0.46) than Chinese students (3.01 ± 0.50), although the median scores were similar (Table 5). Overall, the descriptive findings suggest minimal differences in CPR knowledge and attitudes between the two groups.

Table 3. Descriptive Statistics

Variable	Group	N	Minimum	Maximum	Mean	SD
CPR Knowledge	China	30	1	9	5.87	2.13
	Indonesia	30	1	9	5.83	2.31
CPR Attitude	China	30	1.92	4	3.01	0.50
	Indonesia	30	1.67	4	3.11	0.46

The Shapiro–Wilk test was performed to assess the distribution of CPR knowledge and attitude scores in each group (Table 4). Knowledge scores among Indonesian students deviated significantly from a normal distribution (W = 0.929, p = .047), whereas no statistically significant deviations were detected for knowledge scores among Chinese students (p = .099) or attitude scores among Chinese (p = .103)

and Indonesian (p = .110) students. Accordingly, the Mann–Whitney U test was used for both between-group comparisons.

Table 4. Shapiro–Wilk Normality Test

Variable	Group	Statistic	Sig.
CPR Knowledge	China	0.941	0.099
	Indonesia	0.929	0.047
CPR Attitude	China	0.942	0.103
	Indonesia	0.943	0.110

Comparison of CPR Knowledge and Attitudes between Countries

Table 5 presents the results of the Mann–Whitney U tests comparing CPR knowledge and attitude scores between Chinese and Indonesian students. No statistically significant difference was observed in CPR knowledge scores between the Chinese (median = 6, IQR = 5–7) and Indonesian (median = 5, IQR = 4–8) groups (U = 466, p = .817). The rank-biserial correlation (r = .04) indicated a negligible effect size.

Similarly, CPR attitude scores did not differ significantly between Chinese (median = 3.21, IQR = 2.69–3.33) and Indonesian (median = 3.17, IQR = 2.77–3.42) students (U = 400, p = .463), with a small effect size (r = -.11). Although neither comparison reached statistical significance, these findings should not be interpreted as evidence of equivalence between the groups, particularly given the limited sample size.

Table 5. Comparison of CPR Knowledge and Attitude Scores between Chinese and Indonesian Students (Mann–Whitney U Test)

Outcome	China (n = 30)	Indonesia (n = 30)	U	p	Rank-biserial r
CPR knowledge	6 (5–7) 5.87 ± 2.13	5 (4–8) 5.83 ± 2.31	466	.817	.04
CPR attitudes	3.21 (2.69–3.33) 3.01 ± 0.50	3.17 (2.77–3.42) 3.11 ± 0.46	400	.463	-.11

Note: For each country, the first line shows the median (IQR), and the second shows mean ± SD. U is the Mann–Whitney statistic for the Chinese group. Rank-biserial r: positive values indicate higher scores in the Chinese group (|r| < .10, negligible; .10–.29, small). Statistical significance was set at p < .05.

Table 6. Correlation between CPR Knowledge and CPR Attitude (Spearman)

Variable	CPR Knowledge	CPR Attitude
CPR Knowledge (r)	1	0.286
Sig. (2-tailed)	—	0.027
N	60	60
CPR Attitude (r)	0.286	1
Sig. (2-tailed)	0.027	—
N	60	60

Association between CPR knowledge and attitudes

Spearman's rank correlation analysis revealed a weak but statistically significant positive association between CPR knowledge and attitudes in the combined sample (n = 60; ρ = .286, p = .027; Table 6). This finding indicates that students with higher CPR knowledge scores tended to report more positive attitudes toward CPR, although the association was relatively weak.

DISCUSSION

This study found no statistically significant differences in cardiopulmonary resuscitation (CPR) knowledge or attitudes between physical education (PE) students at the participating universities in Indonesia and China. The mean knowledge scores were similar in both groups (5.87 and 5.83 out of nine, respectively), exceeding the mean score of 2.078 out of nine reported among general university students in Chongqing, China (Mao et al., 2021). This difference may reflect variations in academic backgrounds, as PE students may have greater exposure to sports safety and first-aid education than students from other disciplines. However, previous CPR training was not assessed in the present study, and differences in measurement instruments, scoring procedures, and sampling methods limit direct comparisons. Despite the relatively higher scores, participants achieved only approximately 65% of the maximum possible knowledge score, suggesting considerable room for improvement. This finding is consistent with research involving PE students in Jordan, which reported inadequate CPR knowledge regardless of previous training experience (Manaseer et al., 2025).

Regarding attitudes, both groups obtained mean scores above the midpoint of the four-point scale (3.01 in China and 3.11 in Indonesia), suggesting generally favorable attitudes toward CPR. Similar findings have been reported among university students, whose attitudes toward CPR were relatively positive despite varying levels of knowledge (Manaseer et al., 2025; Mercuri et al., 2026). For example, Mercuri et al. (2026) reported favorable CPR attitudes among health sciences students in Italy, although their perceived preparedness to perform resuscitation in complex situations remained limited. These findings suggest that favorable attitudes do not necessarily indicate sufficient practical competence or confidence to respond effectively to cardiac emergencies. Nevertheless, because practical CPR skills were not assessed in the present study, participants' actual emergency response capabilities remain unknown.

The absence of statistically significant between-country differences should be interpreted cautiously. Nonsignificant results do not establish equivalence, particularly given the relatively small sample size of 30 participants per group and the absence of a formal equivalence analysis. The rank-biserial effect sizes were negligible for knowledge ($r = .04$) and small for attitudes ($r = -.11$), although the precision of these estimates remains uncertain because confidence intervals were not calculated. One possible explanation for the similar scores is that students in both countries may have received comparable levels of CPR education. However, institutional curricula and previous training experiences were not examined, making this explanation speculative. Previous studies have identified inconsistencies in CPR training requirements and emergency preparedness among teachers and coaches (Bakke et al., 2017; Mason et al., 2022; Post et al., 2019). Furthermore, González-Moret et al. (2025) demonstrated significant improvements in CPR knowledge and attitudes among professional football players and coaches following a structured two-hour training intervention. Although these findings support the potential benefits of structured CPR education, the present cross-sectional study cannot determine whether similar interventions would produce comparable improvements among PE students.

The demographic composition of the sample also warrants consideration. Both groups included 19 male and 11 female participants, resulting in identical sex distributions. Previous research has identified sex-related disparities in bystander CPR provision and receipt, potentially influenced by concerns about physical contact and sociocultural expectations (Blewer et al., 2024). Although demographic matching improved comparability between the two groups in terms of sex, age, and academic semester, the present study did not examine sex-specific differences in CPR knowledge or attitudes. Future studies with larger and more diverse samples should investigate whether demographic characteristics influence CPR-related knowledge, attitudes, and willingness to intervene.

A weak but statistically significant positive association was observed between CPR knowledge and attitudes ($\rho = .286$, $p = .027$). This finding indicates that students with higher knowledge scores tended to report more favorable attitudes, although the strength of the association was limited. A related pattern was reported by Wei et al. (2025), who applied the Theory of Planned Behavior to examine CPR-related behavioral intentions among Chinese university freshmen. Their findings indicated that CPR knowledge was a substantially weaker predictor of behavioral intention ($\beta = .027$) than attitudes ($\beta = .439$) and subjective norms ($\beta = .272$). Although behavioral intention and attitudes represent distinct constructs, these findings collectively suggest that CPR knowledge alone may not adequately explain individuals' willingness or preparedness to intervene. Other factors, including self-efficacy, perceived social expectations, and practical training experience, may also be relevant. Accordingly, CPR education for PE students may benefit from combining theoretical instruction with hands-on practice, scenario-based learning, and opportunities to develop confidence in emergency response. However, the association observed in the present study does not establish a causal relationship between knowledge and attitudes.

These findings have practical implications for PE education, given the potential responsibilities of future teachers and coaches in ensuring the safety of students and athletes. Bystander CPR remains an important public health concern in both countries. National registry data indicate that approximately 20.3% of out-of-hospital cardiac arrest cases in China receive bystander CPR (Pacific, 2024). In Indonesia, challenges in prehospital cardiac arrest management have also been documented, particularly in primary healthcare settings and resource-limited communities (Sasmito et al., 2024). Recommendations emphasizing emergency action plans, CPR training, and access to automated external defibrillators (AEDs) in sports settings further underscore the importance of emergency preparedness among sports professionals (Malik et al., 2023). Although the present findings do not directly evaluate the effectiveness of CPR education, they support considering structured, practice-based training within PE curricula. Such approaches may help address potential gaps in CPR knowledge while providing opportunities to strengthen practical skills and confidence in responding to emergencies (González-Moret et al., 2025; Manaseer et al., 2025).

Limitations of the study

Several limitations should be acknowledged. First, the relatively small sample size, nonprobability convenience sampling, and recruitment from only one university

in each country limit the generalizability of the findings. Furthermore, selecting 30 Chinese participants from an initial sample of 108 through demographic matching may have introduced selection bias. Although the selection was conducted independently of CPR scores, the exclusion of 78 Chinese respondents means that the findings may not fully represent the original Chinese sample. Second, the cross-sectional design precludes causal inferences regarding the relationship between CPR knowledge and attitudes. The pooled correlation analysis may also be influenced by between-group characteristics, as country-specific associations were not examined. Third, the study was not designed or adequately powered to establish equivalence; therefore, the absence of statistically significant differences should not be interpreted as evidence of equivalent outcomes.

Fourth, the questionnaire was developed by the authors without formal content validation or pilot testing. The Mandarin version was prepared using an online translation tool without a formal forward–backward translation procedure, and measurement equivalence between the Indonesian and Mandarin versions was not established. Consequently, potential linguistic and measurement differences may have influenced the cross-national comparisons. Internal consistency was also modest for the knowledge subscale, particularly among Chinese participants (KR-20 = .633), compared with the Indonesian group (KR-20 = .700). Fifth, formal approval from an institutional research ethics committee was not obtained, although informed consent was secured, participation was voluntary, and no personally identifiable information was collected. Finally, CPR knowledge and attitudes were assessed through self-administered questionnaires without evaluating practical CPR skills, previous training experiences, or institutional curricula. These limitations highlight the need for larger, multicenter studies using validated, culturally adapted instruments and objective assessments of CPR competence. Future longitudinal and intervention studies should also examine the effectiveness of structured CPR training in improving knowledge, attitudes, practical skills, and emergency response preparedness among PE students.

CONCLUSION

This study identified no statistically significant differences in CPR knowledge or attitudes between PE students at the participating universities in Indonesia and China. However, the small sample size, nonrandom sampling, and absence of equivalence testing preclude conclusions regarding equivalence between the groups. A weak but statistically significant positive association was observed between CPR knowledge and attitudes, suggesting that greater knowledge was associated with more favorable attitudes, although the relationship was limited in magnitude. These findings highlight the potential value of integrating structured, hands-on CPR education into PE curricula to support emergency preparedness among future teachers and coaches. Further research involving larger, more diverse samples, validated instruments, and longitudinal or experimental designs is needed to evaluate the effectiveness of CPR training and inform evidence-based curriculum development.

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AI DISCLOSURE STATEMENT

During the preparation of this work, the authors used Grammarly to assist with language editing, grammar improvement, and manuscript organization. After using these tools, the authors carefully reviewed, revised, and verified the content and take full responsibility for the accuracy, integrity, and final content of the published article.

DATA AVAILABILITY

The data supporting the findings of this study are available from the corresponding author upon reasonable request. The data are not publicly available due to participant privacy and confidentiality considerations.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

PUBLISHER'S NOTE

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