**EIT 6405 PRISMA Flow Diagram**

**Figure 1 – PRISMA Flow Diagram**

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**Table 1 - Augmented Reality (AR) for Basic Life Support Training**

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| --- | --- | --- | --- | --- | --- |
| **Study Acronym;**  **Author;**  **Year Published** | **Aim of Study; Study Type;**  **Study Size (N)** | **Study Population** | **Study Intervention**  **(# study participants) /**  **Study Comparator**  **(# study participants)** | **Endpoint Results**  **(Absolute Event Rates, P value; OR or RR; & 95% CI)** | **Relevant 2° Endpoint (if any);**  **Study Limitations; Adverse Events** |
| Leary et al. 2020 | Aims: To compare the use of AR CPR refresher training with standard audio-visual feedback manikin to improve HCP CPR training.  Type: RCT  N=100 | Nursing student | Intervention:  AR-assisted feedback (AR system that integrate Hololens with a CPR feedback device)  (n=50)  Comparator:  CPR manikin with regular audiovisual feedback system  (n=50) | Compression Depth:  Control vs intervention 49±8mm vs. 52±8mm (p=0.09)  Compression Rate: Control vs intervention 117±11cpm vs. 122±15cpm (p=0.10)  Proportion of participants with both guideline compliant CC depth and rate:  Control vs intervention: 17/47 (36%) vs. 8/49 (16%), p=0.03) | No significant difference between the groups in compression depth and rate. AR inferior to regular AV feedback in proportion of participants with excellent CC  Limitations:  Baseline equivalence not achieved. No adjusted analysis conducted.  Interpretation: Favors non-AR (regular AV feedback, not significant) |
| Jeffers et al. 2022 | Aims: To compare the use of AR-assisted CPR feedback versus CPR training with no feedback  Type: RCT  N=34 | Healthcare providers and HCP students | Intervention:  2-min CPR with AR-assisted feedback  N=16  Comparator:  2-min CPR on manikin with no feedback (N=18) | Percentage of excellent rate:  Control vs intervention: 76% vs. 90%, p=0.06  Percentage of good depth:  Control vs intervention: 21% vs. 79%, p < 0.01  Percentage of excellent CC:  control vs intervention: 17% vs. 73%, p < 0.01 | AR-assisted feedback improved the CPR performance.  Limitation:  Small study  Interpretation: Favors AR |
| Hou et al. 2022 | Aims: To compare the use of AR-assisted instruction versus instructor-assisted teaching in CPR training  Type: RCT  N=28 | Lay providers | Intervention:  Real-time AR-assisted CPR training (n=14)  Comparator:  Conventional real-time supervisor-assisted CPR training (n=13) | Mean compression depth: control vs intervention: 4.87 vs. 5.05cm, MD: 0.18 (-0.18 – 0.53)cm, p =0.32  Mean rate:  Control vs intervention: 110/min vs. 109/min, p = 0.48 | No significant difference between the AR-assisted teaching vs instructor-based CPR training.  Limitation:  Small sample size  Interpretation: Non-significant (Favors AR-assisted instruction) |

AR – augmented reality, CPR - cardiopulmonary Resuscitation, HCP - health care professional, RCT – randomized controlled trial

**Table 2 – Virtual Reality (VR) Training for Basic Life Support (Lay People)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **~~Study Acronym;~~**  **Author;**  **Year Published** | **Aim of Study; Study Type;**  **Study Size (N)** | **Study Population** | **Study Intervention**  **(#study participants) /**  **Study Comparator**  **(#study participants)** | **Endpoint Results**  **(Absolute Event Rates, P value; OR or RR; & 95% CI)** | **Relevant 2° Endpoint (if any);**  **Study Limitations; Adverse Events** |
| Nas et al. 2020 | Aims: To compare CPR quality with VR training and face-to-face training  Type: RCT  N=381 | Adult lay people | Control: Instructor-led 20 min CPR training  (n=191)  Intervention: 20 min VR-based CPR training (n=190) | Primary:  Compression depth  Control vs intervention: 56.8 vs. 49.1mm, 95%CI: -7.7 (-9.4, -6.0mm) (VR inferior to control)  Compression rate control vs. intervention:  108bpm vs. 114.3bpm, 95%CI: 5.7 (3.3 – 8.2bpm)  Secondary outcome:  % of participants with depth 50–60mm: 51% (VR) vs. 75% (instructor), p<0.01  % of participants with rate 100–120/min: 50% (VR) vs. 63% (instructor), p=0.01 | Instructor-led face-to face CPR training superior to VR-based CPR training.  Interpretation: Favors non-VR (Face-to-face training) |
| Nas et al. 2022 | Aims: To compare willingness to conduct by-stander CPR for participants trained with VR training and face-to-face training  Type: Secondary analysis of data from RCT  N = (188/320  responded to survey, response rate 61%) | Adult lay people | Control: Instructor-led 20 min CPR training  (n=97)  Intervention: 20 min VR-based CPR training (n=91) | Primary:  Willingness to perform CPR at 6 months after training:  Control vs intervention: 81% vs. 71%, p=0.02  Face-to-face group superior to VR group  Secondary  Knowledge retention:  Control vs Intervention:  7/9 vs. 7/9 questions, p=0.81 | At 6-month post training survey, lay provider’s willingness to perform CPR was superior in face-to-face training group. The difference in knowledge equivalence was not significant.  Interpretation: Favors non-VR (Face-to-face training) |
| Hubail et al. 2022 | Aims: To compare a VR CPR teaching program to current teaching methods (manikin-based conventional teaching  Type: RCT (pilot)  N=26 | Adult lay providers | Control:  4-hour Certified instructor-led course with lectures and hands-on skill practice (n=13)  Intervention:  Instructor led training, participants with VR headsets and hand sensors (n=13)  10–14 min training with VR | Primary CPR quality  (Traditional v. VR)  Depth: 47 vs. 45mm, p=0.21  Rate: 113 vs. 111 bpm, p=0.36  Recoil: 78% vs. 83%, p=0.32  Overall performance checklist:  9.61 vs. 8.53, p-value not presented.  (calculated mean difference 1.08, 95%CI: -0.52–2.68, p=0.18) | Conclusion: VR teaching method is appealing with non-inferior learning results.  (Not significant difference between the groups)  Limitations:  This study is too small (N=26) to conclude non-inferiority or equivalence.  Interpretation: Favors non-VR (non-significant) |
| Castillo et al. 2023 | Aims: To evaluate the effect of VR BLS-AED training relative to traditional training at the conclusion of the course and 6-month retention  Type: Quasi-experimental (No description on randomization process)  N=341 | 1st year university students | Control (CG): Traditional Training (n=116)  Intervention (EG): Training with Virtual Reality (n=125) | At conclusion of the course:  CG: EG non-significant results for knowledge test (p=0.24), compression depth (p=0.24), % of compression rate (p=0.71), % of complete recoil (p=0.80)  At 6 month retention:  Large proportion of missing data (CG n=56, EG n=64)  CG: EG non-significant results for knowledge test (p=0.75), compression depth (p=0.33), % of compression rate (p=0.86), % of complete recoil (p=0.57) | Conclusion: VR showed similar results compared to conventional CPR training.  Limitation  -Missing data for 6-months retention  -Non-randomization  Interpretation: Non-significant |
| Liu et al. 2021 | Aims: To evaluate the effect of VR on BLS training  Type: Quasi-experimental, 2x2 factorial (no description on randomization)  N=120 | 1st year college students | Control 1: video training without pre-training intervention (n=30)  Control 2: Video training with pre-training intervention (n=30)  Intervention 1: VR training without pre-training intervention (n=30)  Intervention 2: VR training with pre-training intervention (n=30) | Skill acquisition (CPR scores measured by Laerdal skillreporter)  Video1: 66.9  Video2: 58.7  VR1: 53.7  VR2: 69.2  ANOVA: non-significant effect on VR (p=0.82)  Knowledge acquisition:  Video1: 6.5  Video2: 6.8  VR1: 6.4  VR2: 6.7  ANOVA: non-significant effect on VR (p=0.65) | Conclusion: VR not superior to 2d-video based training in CPR quality and knowledge retention.  Limitation  Lack of randomization process  Lack of validity evidence for outcome measures  Important outcomes not reported (compression depth, rate and recoil)  Interpretation: Non-significant |
| Liu et al. 2022 | Aims: To evaluate the effect of VR on self-efficacy and knowledge of kindergarten teachers  Type: Quasi-experimental  N=50 | Kindergarten teachers | Control:  Conventional video-based training  Intervention: VR-based CPR and AED training | Knowledge test  Adjusted mean difference in general estimating equation analysis:  At the conclusion of course:  Mean difference: 1.08, p=0.03  5-week retention:  Mean difference 1.92, p=0.02 | Conclusion: Compared to conventional training, VR-based training significantly improve the acquisition and retention of CPR knowledge in kindergarten teachers.  Interpretation: Favors VR |
| Leary et al. 2019 | Aims: To examine whether using a VR mobile App for CPR training would improve bystander response compared with standard mobile App CPR training  Type: RCT  N=105 | Adult Lay rescuers | Control: CPR training with mobile App (2D)  Intervention: CPR training with VR mobile App | Primary:  Bystander response (VR vs. mobile App)  Call 911: 82% vs. 58%, p<0.01  Ask for AED: 57% vs. 28%, p<0.01  Secondary:  CPR quality (VR vs. mobile App)  Depth: 38mm vs. 44mm, p=0.05  Rate: 104 vs. 112bpm, p=NS | Conclusion: Bystander responses for calling 911 and asking for AED was significantly increased with VR training, however, the CC depth was significantly decreased with VR training.  Interpretation: Favors VR in bystander response  Favors non-VR in CPR quality |
| Barsom et al. 2020 | Aims: To examine the effect of VR enhanced curriculum on CPR knowledge in high school students  Type: RCT  N=40 | High school students | Control:  e-learning module + 2D video  Intervention:  e-learning module + VR training | Primary  CPR knowledge  Control (pre-post): 56–79, p<0.01  VR (pre-post): 49–82, p<0.01  Between group difference in delta: 25 vs. 32, p=0.04 | Conclusion: VR training significantly improve the CPR knowledge of high-school students.  Limitations  Small sample size  Lack of validity evidence for assessment tools  Interpretation: Favors VR |

AED – automated external defibrillator, BLS – basic life support, CPR - cardiopulmonary Resuscitation, HCP - health care professional, RCT – randomized controlled trial, VR – virtual reality

**Table 3 - Virtual Reality (VR) for Basic and Advanced Life Support Training (Healthcare Providers)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Study Acronym;**  **Author;**  **Year Published** | **Aim of Study; Study Type;**  **Study Size (N)** | **Study Population** | **Study Intervention**  **(#study participants) /**  **Study Comparator**  **(#study participants)** | **Endpoint Results**  **(Absolute Event Rates, P value; OR or RR; & 95% CI)** | **Relevant 2° Endpoint (if any);**  **Study Limitations; Adverse Events** |
| **Basic Life Support Training** | | | | | |
| Issleib et al 2021 | Aims:  To compare the VR training module with the conventional CPR training  Type: RCT(1:2)  N = 160 | Population:  First-year medical students | Intervention  25 min VR module + 10 min VR module chest compression (n = 56)  Control:  Conventional BLS course with seminar and basic skill training (45 min lecture + 1 hr practical session, n = 104) | No Flow Time in a 3 min practical exam  Control vs Intervention: 82 sec vs 92 sec, p < 0.001  Secondary outcome: self-assessed learning gain (NOT included in this review) | Conclusion:  VR training group significantly inferior to conventional training in NFT  Limitation  -missing important outcomes (compression depth and rate)  Interpretation:  Favors non-VR (conventional teaching) |
| Moll-Khosrawi et al. 2022 | Aims: To explore the effectiveness of a VR BLS training vs web-based training during the COVID-19 pandemic  Type: RCT  N=88 | First-year medical students | Intervention  Web-based BLS training + VR BLS training module  Control:  Web-based BLS training | No flow time in a 3min practical exam:  Control vs. Intervention: 11.1sec vs. 8.7 sec, difference estimated by a general linear regression model indicated a difference between the two groups of about 28% (95%CI: 8–43%, p<0.01)  Secondary outcomes:  Overall BLS performance estimated by checklist (penalty points)  Control vs. intervention: 29.19 vs. 13.75, p<0.01 | Conclusion: Medical students receiving additional VR BLS modules were superior to web-based training alone in no flow time and overall BLS performance assessed by checklist.  Limitations  Missing important outcomes (no flow time only, no compression depth and rate evaluated)  Intervention group received additional VR training, thus VR training is compared with “no intervention” (A vs. A+X)  Interpretation: Favors VR |
| Aksoy et al. 2019 | Aims: To compare the effects on knowledge gain after using a VR based serious gaming module for BLS vs a tablet based serious game  Type: RCT  N=50 (40 included in the analysis) | Paramedic student | Intervention:  VR-based serious game for BLS knowledge  Control:  PC-tablet serious game for BLS knowledge | Knowledge tests  Tablet Group (pre-post): 53.2 vs. 62.1, p<0.01  VR (pre-post): 47.7 vs 65.4, p<0.01  Between group difference in delta:  Tablet vs VR: 8.9 vs. 17.6, p=0.02 | Conclusion: VR-based BLS serious game was superior to PC tablet based serious game.  Limitations  Overall high risk of bias  Reporting issues in randomization, serious concerns  No validity evidence presented in assessment tool  20% missing data  Interpretation: Favors VR |
| **Advanced Life Support Training** | | | | | |
| Khanal et al. 2014 | Aims: To compare VR simulator versus traditional face-to-face ACLS training  Type: RCT  N=148 participants (26 teams) | ACLS certified clinicians | Control (CG): traditional ACLS training  Intervention 1 (CG1): VR ACLS training with comprehensive feedback  Intervention 2: VR ACLS training with limited feedback | Adherence to AHA guidelines in two scenarios (PEA & VF/VT); pre vs. post: CG (PEA, p=0.02; VF/VT; p=0.01); IG1 (PEA, p=0.02; VF/VT; p=0.048); IG2 (no differences).  Post-test: No differences between CG and IG1, IG1 and IG2.  Differences between CG (82 out of 120 tasks) and IG2 (59 out of 120 tasks) (VF/VT; p=0.02)  VR training could be worse than conventional training if no sufficient feedback was provided. | Conclusion: VR-based ACLS training with proper feedback components can provide a learning experience similar to face-to-face training  Limitation  Sample size too small to conclude non-inferiority  Interpretation: Non-significant |
| Umoren et al. 2021 | Aims: To compare VR simulation vs video for maintenance of NRP skills in healthcare workers in resource-scarce setting.  Type: RCT  N=274 nurses and midwives | Practicing nurses and midwives | Control: Standard practice, Digital HBB provider’s guide  Intervention1 (video): video + HBB providers’ guide  Intervention2 (VR): VR + digital HBB provider’s guide | Compared to HBB course alone, or HBB + video training, HBB + VR at 6Mt follow-up for BVM, OSCE tests did not yield statistically significant difference (BMV: p=0.71, OSCE A: 0.78; OSCE B: 0.18) | Conclusion: eHBB VR training was not significantly different from standard practice or 2D video training.  Interpretation: Non-significant |
| Yang et al. 2022 | Aims: To compare VR-based neonatal resuscitation gamification program versus high-fidelity simulation and online lectures.  Type: Quasi-experimental  N=74 | Nursing students | Control Group:  Online NRP program lecture  Simulation Group: NRP training with high fidelity simulator  Intervention (VR Group): NRP gamification VR program | The neonatal resuscitation nursing knowledge score of the three groups increased from pre-intervention to post-intervention (VR group: 12.52±4.38 to 18.00±2.55; simulation group: 12.79±6.10 to 15.79±5.43; control group: 10.81±4.35 to 11.8±4.08)  Between group difference: VR group and simulation group superior to control group. No difference between the simulation group and VR group | Conclusion: The neonatal resuscitation gamification program using immersive VR was found to be effective but showed non-significant difference from 2D online training or high-fidelity simulation training in knowledge acquisition.  Limitations  Non-randomized trial  Small sample size  Interpretation: Non-significant |

ACLS – advanced cardiac life support, BLS – basic life support, CPR - cardiopulmonary resuscitation, HBB – helping babies breathe, HCP - health care professional, NRP – neonatal resuscitation program, RCT – randomized controlled trial, VR – virtual reality

**Table 4: Risk of bias assessment for randomized controlled trials**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| First author, year | Type of course | Type of participant | Type of immersive techno-logy | Random-ization | Deviations from  intended intervention | Outcome data  missing | Measurement of outcome | Selection of  reported results | Overall |
| Khanal, 2014 | ALS | HCP | VR | High | High | Low | High | Low | High |
| Leary, 2019 | BLS | Lay rescuer | VR | High | Low | Low | Low | Low | High |
| Nas, 2019 | BLS | Lay rescuer | VR | Low | Low | Low | Low | Low | Low |
| Barson, 2020 | BLS | Lay rescuer | VR | High | Low | Low | Low | Low | High |
| Leary, 2020 | BLS | HCP | AR | Low | Low | Low | Low | Low | Low |
| Issleib, 2021 | BLS | HCP | VR | High | Some | Some | Low | Low | High |
| Liu Ze-Min, 2021 | BLS | Lay rescuer | VR | High | Low | Low | Low | Low | High |
| Umoren, 2021 | ALS | HCP | VR | Low | Low | Low | Low | Low | Low |
| Hou, 2022 | BLS | Lay rescuer | AR | Low | Low | Low | Low | Low | Low |
| Hubail, 2022 | BLS | Lay rescuer | VR | Low | Low | Low | Low | Low | Low |
| Jeffers, 2022 | PALS | HCP | AR | Low | Low | Low | High | Low | High |
| Moll Ksosrawi, 2022 | BLS | HCP | VR | Low | Low | Low | Low | Low | Low |
| Nas, 2022 | BLS | Lay rescuer | VR | Low | Low | High | High | Low | High |
| Aksoy, 2019 | BLS | HCP | VR | High | Low | Some | Low | Low risk | High |
| Liu Qian, 2021 | BLS | Lay rescuer | VR | High | Low | Low risk | Low | Low risk | High |
| Castillo 2023 | BLS | Lay rescuer | VR | High | Low | Some | Low | Low risk | High |

BLS – Basic Life Support, ALS – Advanced Life Support, VR – Virtual reality, AR – Augmented reality

**Table 5: Risk of bias assessment for non-randomized controlled trials**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Study | Type of training | Type of Participant | Type of immersive technology | Confound-ing | Selection | Classification  of intervention | Deviations from  intended intervention | Outcome data  missing | Measure-ment of outcomes | Selection of  reported results | Overall |
| Yang, 2022 | ALS | HCP | VR | Serious | Moderate | Low | Low | Low | Low | Low | Serious |

ALS – Advanced Life Support, VR – Virtual reality,

**Table 6 - Outcomes for Augmented Reality (AR) Studies**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Study | Number – Control vs. Intervention (AR) | Outcome – Control | Outcome – Intervention (AR) | P value |
| **CPR Depth** | | | | |
| Leary 2020 | 50 vs. 50;  Total 100 | 49mm | 5 mm | P=0.09 |
| Hou 2022 | 13 vs. 14;  Total 27 | 48.7mm | 50.5mm | P=0.32 |
|  | | | | |
| **CPR Depth Compliance** | | | | |
| Jeffers 2022 | 18 vs. 16;  Total 34 | 21% | 79% | P<0.01 |
|  | | | | |
| **CPR Rate** | | | | |
| Leary 2020 | 50 vs. 50;  Total 100 | 117bpm | 122bpm | P=0.10 |
| Hou 2022 | 13 vs. 14;  Total 27 | 110bpm | 109bpm | P=0.48 |
|  | | | | |
| **CPR Rate Compliance** | | | | |
| Jeffers 2022 | 18 vs. 16;  Total 34 | 76% | 90% | P=0.06 |
|  | | | | |
| **Overall CPR Performance** | | | | |
| Leary 2020 | 50 vs. 50;  Total 100 | 36% | 16% | P=0.03 |
| Jeffers 2022 | 18 vs. 16;  Total 34 | 17% | 73% | P<0.01 |

AR – augmented reality, bpm – beats per minute

**Table 7 – Knowledge Outcomes for Virtual Reality (VR) BLS studies**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Study | Number – Control vs. Intervention (VR) | Outcome – Control | Outcome – Intervention (VR) | P value |
| **Knowledge acquisition** | | | | |
| Aksoy 2019 | 18 vs. 22;  Total 40 | Mean 8.9 (pre-post difference in knowledge test score) | Mean 17.6 (pre-post difference in knowledge test score) | P=0.021 |
| Barsom 2020 | 20 vs. 20;  Total 40 | Median 25 (pre-post difference in knowledge score) | Median 32 (pre-post difference in knowledge score) | P=0.035 |
| Castillo 2023 | 116 vs. 125;  Total 241 | 8.21 (score after training) | 8.44 (score after training) | P=0.24 |
| Liu 2021 | 30 vs. 30 (video vs. VR; both without pretraining);  Total 60 | 6.53 (score after training) | 6.43 (score after training) | P=0.66 |
| Liu 2022 | 25 vs. 25;  Total 50 | 2.24 (pre-post difference in knowledge score) | 3.32 (pre-post difference in knowledge score) | P=0.03 |
|  | | | | |
| **Knowledge retention** | | | | |
| Castillo 2023 | 56 vs. 64;  Total 120 | 6.55 (score at 6 months) | 6.25 (score at 6 months) | P=0.75 |
| Liu 2022 | 25 vs. 25;  Total 50 | -0.08 (pre-post difference in knowledge score at 5 weeks) | 1.84 (pre-post difference in knowledge score at 5 weeks) | P=0.02 |
| Nas 2022 | 97 vs. 91;  Total 188 | 7 (score at 6 months) | 7 (score at 6 months) | P=0.81 |

VR – virtual reality

**Table 8 – Skills Outcomes for Virtual Reality (VR) BLS studies**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Study | Number – Control vs. Intervention (VR) | Outcome – Control | Outcome – Intervention (VR) | P value |
| **No Flow Time / Chest Compression Fraction** | | | | |
| Issleib 2021 | 104 vs. 56;  Total 160 | 82sec (no flow time) | 93sec | P<0.01 |
| Moll Khosrawi 2022 | 42 vs. 46;  Total 88 | 8.0sec (no flow time) | 5.8sec | P=0.01 |
| Nas 2020 | 177 vs. 175;  Total 352 | 67% (CCF) | 61% | P<0.01 |
|  | | | | |
| **CPR Depth** | | | | |
| Castillo 2023 | 116 vs. 125;  Total 241 | 47.1mm | 46.0mm | P=0.24 |
| Hubail 2022 | 13 vs. 13;  Total 26 | 47.2mm | 45.1mm | P=0.21 |
| Leary 2019 | 53 vs. 52;  Total 105 | 44.0mm | 38.0 mm | P=0.05 |
| Nas 2020 | 177 vs. 175;  Total 352 | 56.8mm | 49.1 mm | P<0.01 |
|  | | | | |
| **CPR Depth Compliance** | | | | |
| Nas 2020 | 177 vs. 175;  Total 352 | 75% | 51% | P<0.01 |
|  | | | | |
| **CPR Rate** | | | | |
| Hubail 2022 | 13 vs. 13;  Total 26 | 114bpm | 111bpm | P=0.36 |
| Leary 2019 | 53 vs. 52;  Total 105 | 112bpm | 104bpm | P=NS |
| Nas 2020 | 177 vs. 175;  Total 352 | 108bpm | 114bpm | P<0.01 |
|  | | | | |
| **CPR Rate Compliance** | | | | |
| Castillo 2023 | 116 vs. 125;  Total 241 | 61.9% | 60.3% | P=0.71 |
| Nas 2020 | 177 vs. 175;  Total 352 | 63% | 50% | P=0.01 |
|  | | | | |
| **Chest Recoil Compliance** | | | | |
| Castillo 2023 | 116 vs. 125;  Total 241 | 70.5% | 71.6% | P=0.80 |
| Hubail 2022 | 13 vs. 13;  Total 26 | 78.2% | 83.4% | P=0.33 |
| Nas 2020 | 177 vs. 175;  Total 352 | 88% | 98% | P=0.02 |
|  | | | | |
| **Overall CPR Performance** | | | | |
| Hubail 2022 | 13 vs. 13;  Total 26 | 9.61 (CPR Score after training) | 8.53 (CPR Score after training) | P=0.09 |
| Liu 2021 | 30 vs. 30 (video vs. VR; both without pretraining);  Total 60 | 66.9 (CPR score after training) | 53.7 (CPR score after training) | P=0.82 |
|  | | | | |
| **CPR Depth – Retention at 6 months** | | | | |
| Castillo 2023 | 56 vs. 64;  Total 120 | 44.7 mm | 42.7mm | P=0.33 |
|  | | | | |
| **CPR Rate Compliance – Retention at 6 months** | | | | |
| Castillo 2023 | 56 vs. 64  Total 120 | 52.2% | 50.1% | P=0.86 |
|  | | | | |
| **Chest Recoil Compliance - Retention** | | | | |
| Castillo 2023 | 56 vs. 64;  Total 120 | 79.5% | 77.3% | P=0.57 |

CCF – chest compression fraction, CPR – cardiopulmonary resuscitation, VR – virtual reality

**Table 9 – Willingness to Perform CPR for Virtual Reality (VR) BLS studies**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Study | Number – Control vs. Intervention | Outcome – Control | Outcome – Intervention (VR) | P value |
| Nas 2022 | 97 vs. 91  Total 188 | 81% (willingness to perform CPR 6 months post training) | 71% (willingness to perform CPR 6 months post training) | P=0.02 |

**Table 10 – Outcomes for Virtual Reality (VR) ALS studies**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Study | Number – Control vs. Intervention (VR) | Outcome – Control | Outcome – Intervention (VR) | P value |
| **Knowledge** | | | | |
| Yang 2022 | 28 vs. 29 | 3.00 (pre-post difference) | 5.48 (pre-post difference) | P=NS |
|  | | | | |
| **Adherence to Guidelines** | | | | |
| Khanal 2014 | Control 50 vs.  VR + comprehensive feedback 49 vs.  VR + limited feedback 49 | 68.3% | 57.5% (VR comprehensive)  49.1% (VR limited) | P=0.37  P=0.05 |
|  | | | | |
| **Clinical Performance – (OSCE A test)** | | | | |
| Umoren 2021 | 88 vs. 91 | 72% (post training) | 76% (post training) | P=0.63 |
| Umoren 2021 | 86 vs. 87 | 72% (retention at 6 months) | 76% (retention at 6 months) | P=0.61 |

VR – virtual reality