Supplementary file

Box - Complete search strategy

PubMed
1. exp Education, nursing/
2. nurs$.ti,ab.
3. educat$.ti,ab.
4. 2 and 3
5. "nursing degree course".ti,ab.
6. student$.ti,ab.
7. 2 and 6
8. exp Students, nursing/
10. 2 and 9
11. exp Teaching/
12. 2 and 11
13. 1 or 4 or 5 or 7 or 8 or 10 or 12
15. AED.ti,ab.
16. exp Airway management/
17. exp Cardiovascular diseases/
18. CPR.ti,ab.
19. exp Critical care/
20. exp Critical care nursing/
21. exp Life support care/
22. defibrillat$.ti,ab.
23. exp Defibrillators/
24. exp Electrocardiography/
25. ECG.ti,ab.
26. exp Electric countershock/
27. electrocardio$.ti,ab.
28. exp Emergencies/
29. exp Emergencies nursing/
30. exp Emergency medical service/
31. exp Emergency treatment/
32. exp Hemodynamics/
33. exp Monitoring, physiologic/
34. "patient deterioration".ti,ab.
35. exp Respiration disorders/
36. exp Respiration, therapy/
37. 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28
or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36
38. fidelity.ti,ab.
40. mannequin$.ti,ab.
41. exp Program development/
42. scenario$.ti,ab.
43. "simulated patient$".ti,ab.
44. "simulation-based training".ti,ab.
45. 38 or 39 or 40 or 41 or 42 or 43 or 44
46. exp Mental processes/
47. $confiden$.ti,ab.
48. exp Clinical decision-making/
49. debrief$.ti,ab.
50. exp Educational measurement/
51. "fitness to practice".ti,ab.
52. gain$.ti,ab.
53. exp Health knowledge, attitudes, practice/
54. exp Needs assessment/
55. "objective structured clinical examination".ti,ab.
56. OSCE.ti,ab.
57. perceive$.ti,ab.
58. perception$.ti,ab.
59. performance$.ti,ab.
60. exp Personal satisfaction/
61. "physical assessment".ti,ab.
62. exp Psychomotor performance/
63. exp Aptitude tests/
64. retain$.ti,ab.
65. satisfact$.ti,ab.
66. exp Self concept/
67. aware$.ti,ab.
68. efficac$.ti,ab.
69. skill$.ti,ab.
70. 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56 or 57 or 58 or 59 or 60 or 61 or 62 or 63 or 64 or 65 or 66 or 67 or 68 or 69 or 70
71. 13 and 37 and 45 and 71
72. limit 72 to (article type="Comparative Study", "Journal Article", "Observational Study", "Clinical Trial", "Controlled Clinical Trial", "Randomized Trial") and (publication date to "2017/05/31")

Scopus
TITLE-ABS-KEY (((nurs* AND educat*) OR "nursing degree course" OR (nurs* AND student*)) OR ("teaching and learning model" AND nurs*)) AND ("acute care" OR aed OR cpr OR defibrillat* OR ecg OR electrocardio* OR "patient deterioration") AND (simulat* OR fidelity OR "human patient" OR manikin* OR mannequin* OR scenario*) AND (confiden* OR debrief* OR "fitness to practice" OR gain* OR "objective structured clinical examination" OR osce OR perceive* OR perception* OR performance* OR "physical assessment" OR retention* OR retain* OR satisfact* OR aware* OR efficac* OR skill*)) [Article types: Article, Article in Press]

CINAHL with Full Text
S71 limit S70 to (document type="academic publication", "journals", "CEU"), ("research article"), (year="1900.01.01"-"2017.05.31") and expand to ("search also in full text")
S70 S12 and S35 and S43 and S69
S69 or/S44-S68
S68 (MH "Mental Processes")
S67 AB (skill*)
S66 AB (efficac*)
S65 AB (aware*)
S64 (MH "Self Concept")
S63 AB (satisfact*)
S62 AB (retain*)
S61 AB (retention*)
S60 (MH "Aptitude Tests")
S59 (MH "Psychomotor Performance")
S58 AB ("physical assessment")
S57 (MH "Student Satisfaction")
S56 AB (performance*)
S55 AB (perception*)
S54 AB (perceive*)
S53 (MH "Student Performance Appraisal")
S52 AB (OSCE)
S51 AB ("objective structured clinical examination")
S50 (MH "Needs Assessment")
S49 (MH "Health Knowledge")
S48 AB (gain*)
S47 AB ("fitness to practice")
S46 (MH "Educational Measurement")
S45 AB (debrief*)
S44 AB (confiden*)
S43 or/S36-S42
S42 (MH "Program Development")
S41 (MH "Problem-Based Learning")
S40 AB (mannequin*)
S39 AB (manikin*)
S38 (MH "Learning Environment")
S37 AB ("human patient")
S36 AB (fidelity)
S35 or/S13-S34
S34 (MH "Respiration Therapy")
S33 (MH "Respiration Disorders")
Table A - NICE Quality Appraisal Checklist for Quantitative Intervention Studies

SECTION 1: POPULATION

1.1 Is the source population or source area well described? Was the country, setting, location (urban, rural), population demographics etc. adequately described?

1.2 Is the eligible population representative of the source population? Was the recruitment well defined? Was the population representative of the source?

1.3 Do the selected participants or areas represent the eligible population or area? Was the method of selection of participants from the eligible population well described? What % of selected individuals or clusters agreed to participate? Were there any sources of bias? Were the inclusion or exclusion criteria explicit and appropriate?

SECTION 2: METHOD OF ALLOCATION TO INTERVENTION (OR COMPARISON)

2.1 Allocation to intervention (or comparison). How was selection bias minimised? Was allocation to exposure and comparison randomised? Was it truly random ++ or pseudo-randomised + (e.g. consecutive admissions)? If not randomised, was significant confounding likely (−) or not (+)? If a cross-over, was order of intervention randomised?

2.2 Were interventions (and comparisons) well described and appropriate? Were interventions and comparisons described in sufficient detail? Were comparisons appropriate?

2.3 Was the allocation concealed? Adequate allocation concealment (+++) would include centralised allocation or computerised allocation systems.

2.4 Were participants or investigators blind to exposure and comparison? Were those delivering or assessing the intervention kept blind to intervention allocation? (Triple or double blinding score ++). If lack of blinding is likely to cause important bias, score −.

2.5 Was the exposure to the intervention and comparison adequate? Is reduced exposure to intervention or control related to the intervention or fidelity of implementation?

2.6 Was contamination acceptably low? Did any in the comparison group receive the intervention or vice versa? If so, was it sufficient to cause important bias? If a cross-over trial, was there a sufficient washout period between interventions?

2.7 Were other interventions similar in both groups? Did either group receive additional interventions or have services provided in a different manner? Were the groups treated equally by researchers or other professionals? Was this sufficient to cause important bias?

2.8 Were all participants accounted for at study conclusion? Were those lost-to-follow-up <20%? Did the proportion dropped differ by group?

2.9 Did the setting reflect usual practice? Did the setting in which the intervention or comparison was delivered differ significantly from usual practice? For example, did participants receive intervention (or comparison) condition in a hospital rather than a community-based setting?

2.10 Did the intervention or control comparison reflect usual practice? Did the intervention or comparison differ significantly from usual practice?

SECTION 3: OUTCOMES

3.1 Were outcome measures reliable? Were outcome measures subjective or objective? How reliable were measures? Was there any indication that measures had been validated?

3.2 Were all outcome measurements complete? Were all or most study participants who met the defined study outcome definitions likely to have been identified?

3.3 Were all important outcomes assessed? Were all important benefits and harms assessed? Was it possible to determine the overall balance of benefits and harms?

3.4 Were outcomes relevant? Where surrogate outcome measures were used, did they measure what they set out to measure?

3.5 Were there similar follow-up times in exposure and comparison groups? If groups are followed for different lengths of time, then more events are likely to occur in the group followed-up for longer distorting the comparison. Analyses can be adjusted to allow for differences in length of follow-up.

3.6 Was follow-up time meaningful? Was follow-up long enough to assess long-term benefits or harms? Was it too long, e.g. participants lost to follow-up?

SECTION 4: ANALYSES

4.1 Were groups similar at baseline? If not, were these adjusted? If so, were these adjusted for in the analyses (e.g. multivariate analyses or stratification)

4.2 Was intention to treat analysis conducted? Were all participants (including dropped out or did not complete the intervention) analysed?

4.3 Was the study sufficiently powered to detect an intervention effect? A power of 0.8 is the conventional standard. Is a power calculation presented?

4.4 Were the estimates of effect size given or calculable? Were effect estimates (e.g. relative risks, absolute risks) given or possible to calculate?

4.5 Were the analytical methods appropriate? Were important differences in follow-up time and likely confounders adjusted for? Were subgroup analyses pre-specified?

4.6 Was the precision of intervention effects given or calculable? Were they meaningful? Were CIs or p values for effect estimates given or possible to calculate?
Figure 1 - HFPS Publication trend
<table>
<thead>
<tr>
<th>n</th>
<th>k</th>
<th>First Author</th>
<th>Title</th>
<th>IF</th>
<th>Country</th>
<th>Aim</th>
<th>Students enrolled</th>
<th>N</th>
<th>Year</th>
<th>Age M (SD)</th>
<th>Females N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Ackermann</td>
<td>Investigation of learning outcomes for the acquisition and retention of CPR knowledge and skills learned with the use of high-fidelity simulation.</td>
<td>1.277</td>
<td>USA</td>
<td>To investigate the impact of variables such as accelerated versus traditional nursing students and the experience with CPR on a living person.</td>
<td>Undergraduate (Baccalaureate)</td>
<td>65</td>
<td>1st</td>
<td>nd</td>
<td>nd</td>
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<td>2a</td>
<td>2b</td>
<td>Ahn 2015</td>
<td>Implementation and outcome evaluation of high-fidelity simulation scenarios to integrate cognitive and psychomotor skills for Korean nursing students.</td>
<td>2.533</td>
<td>South Korea</td>
<td>To implement two high-fidelity simulations to help nursing students integrate their cognitive and psychomotor skills.</td>
<td>Undergraduate (Bachelor)</td>
<td>69</td>
<td>3rd</td>
<td>IG 20.1 (1.2) CG 20.8 (2.7)</td>
<td>IG 32 (91.4) CG 32 (94.1) All 64 (92.8)</td>
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<td>3</td>
<td>4</td>
<td>Akhu-Zaheya</td>
<td>Effectiveness of simulation on knowledge acquisition, knowledge retention, and self-efficacy of nursing students in Jordan.</td>
<td>1.277</td>
<td>Jordan</td>
<td>To examine the effect of high-fidelity BLS simulation on knowledge acquisition, knowledge retention, and self-efficacy of Jordanian nursing students.</td>
<td>Undergraduate (Bachelor)</td>
<td>110</td>
<td>2nd</td>
<td>20.0 (0.6)</td>
<td>74 (67.0)</td>
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<tr>
<td>4a</td>
<td>4b</td>
<td>Amlinier 2006</td>
<td>Effectiveness of intermediate-fidelity simulation training technology in undergraduate nursing education.</td>
<td>1.998</td>
<td>UK</td>
<td>To determine the effect of scenario-based simulation training on nursing students' clinical skills and competence.</td>
<td>Postgraduate (Diploma)</td>
<td>99</td>
<td>2nd</td>
<td>IG 29.3 (7.5) CG 33.0 (8.4) All 31.2 (8.2)</td>
<td>IG 42 (85.7) CG 41 (82.0) All 83 (83.8)</td>
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<td>5</td>
<td>8</td>
<td>Agel 2014</td>
<td>High-Fidelity Simulation Effects on CPR Knowledge, Skills, Acquisition, and Retention in Nursing Students.</td>
<td>1.103</td>
<td>Jordan</td>
<td>To examine the effect of using high-fidelity simulators on knowledge and skills acquisition and retention with university students.</td>
<td>Undergraduate (Baccalaureate)</td>
<td>90</td>
<td>2nd</td>
<td>19.9 (1.8)</td>
<td>71 (79.8)</td>
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<td>6</td>
<td>9</td>
<td>Baptista 2016</td>
<td>Satisfaction and gains perceived by nursing students with medium and high-fidelity simulation: A randomized controlled trial.</td>
<td>2.533</td>
<td>Portugal</td>
<td>To analyze and benchmark gains and satisfaction perceived by nursing students, according to their participation in medium- and high-fidelity simulated practice.</td>
<td>Undergraduate (Bachelor)</td>
<td>85</td>
<td>4th</td>
<td>21.9 (2.8)</td>
<td>IG 44 (98.9) CG 35 (97.2) All 79 (92.9)</td>
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<td>7a</td>
<td>7b</td>
<td>Baxter 2012</td>
<td>Teaching Critical Management Skills to Senior Nursing Students: Videotaped or Interactive Hands-On Instruction?</td>
<td>1.91</td>
<td>Canada</td>
<td>To examine and compare the effectiveness of videotape training versus hands-on instruction in preparing senior nursing students to respond to emergency clinical situations.</td>
<td>Undergraduate (Bachelor)</td>
<td>17 (a) 21 (b)</td>
<td>4th</td>
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<td>8</td>
<td>12</td>
<td>Brauman 2008</td>
<td>Simulator effects on cognitive skills and confidence levels.</td>
<td>1.28</td>
<td>USA</td>
<td>To compare the effects of two instructional methods to teach specific nursing education content on junior-level nursing students' cognitive skills and confidence.</td>
<td>Undergraduate (Baccalaureate)</td>
<td>107</td>
<td>1st</td>
<td>IG 28.6 (8.4) CG 28.3 (7.2)</td>
<td>IG 50 (93.0) CG 51 (96.0) All 101 (79.5)</td>
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<td>9</td>
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<td>Brown 2009</td>
<td>The effect of simulation learning on critical thinking and self-confidence when incorporated into an electrocardiogram nursing course.</td>
<td>1.277</td>
<td>USA</td>
<td>To demonstrate the effect of simulation activities on critical thinking and self-confidence in an electrocardiogram nursing course.</td>
<td>Undergraduate (Baccalaureate)</td>
<td>140</td>
<td>4th</td>
<td>IG 28.0 (nd) CG 26.7 (nd) All 27.5 (nd)</td>
<td>IG 62 (89.0) CG 62 (89.0) All 62 (89.0)</td>
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<td>10a</td>
<td>10b</td>
<td>Chen 2015</td>
<td>Evaluating the impact of high-and low-fidelity instruction in the development of auscultation skills.</td>
<td>4.005</td>
<td>Canada</td>
<td>To explore the effectiveness of HF and low-fidelity instruction on tasks that are chosen to deliberately test skills close to, and more removed from, the clinical environment, within the clinical domains of cardiac and respiratory auscultation and physical assessment skill development.</td>
<td>Undergraduate (Bachelor)</td>
<td>42 (a) 33 (b) 42 (c) 33 (d)</td>
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<td>nd</td>
<td>nd</td>
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<td>11</td>
<td>18</td>
<td>Cobbett 2016</td>
<td>Virtual versus face-to-face clinical simulation in relation to student knowledge, anxiety, and self-confidence in maternal newborn nursing: A randomized controlled trial.</td>
<td>2.533</td>
<td>Canada</td>
<td>To compare the effectiveness of two maternal newborn clinical simulation scenarios; virtual clinical simulation and face-to-face high-fidelity manikin simulation.</td>
<td>Undergraduate (Bachelor)</td>
<td>84</td>
<td>3rd</td>
<td>25.0 (nd)</td>
<td>47 (84.0)</td>
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<td>12</td>
<td>19</td>
<td>Corbridge 2010</td>
<td>Online learning versus simulation for teaching principles of mechanical ventilation to nurse practitioner students.</td>
<td>1.04</td>
<td>USA</td>
<td>To determine differences in knowledge acquisition and student satisfaction between two methods of teaching mechanical ventilation to advanced practice nursing (APN) students: high-fidelity patient simulation versus an online, narrated PowerPoint presentation.</td>
<td>Postgraduate (Advanced Practice Nursing)</td>
<td>20</td>
<td>na</td>
<td>IG 34.5 (10.1) CG 39.2 (9.9)</td>
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<td>13</td>
<td>26</td>
<td>Harris 2011</td>
<td>Simulation-enhanced pediatric clinical orientation.</td>
<td>1.28</td>
<td>USA</td>
<td>To determine the effect of simulation-enhanced orientation on pediatric acute care examination scores and pediatric clinical course grades among junior-level baccalaureate nursing students.</td>
<td>Undergraduate (Baccalaureate)</td>
<td>71</td>
<td>1st</td>
<td>nd</td>
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<td>14a</td>
<td>14b</td>
<td>Kang 2015</td>
<td>Comparison of knowledge, confidence in skill performance (CSP) and satisfaction in problem-based learning (PBL) and simulation with PBL educational modalities in caring for children with bronchiolitis.</td>
<td>1.533</td>
<td>South Korea</td>
<td>To compare changes in nursing students' knowledge, confidence in skill performance (CSP), and satisfaction resulting from training using three educational modalities.</td>
<td>Undergraduate (Bachelor)</td>
<td>131 (a) 136 (b)</td>
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<td>15</td>
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<td>Kardong-Eldgren 2009</td>
<td>VitalSim® versus SimMan®: A comparison of BSN student test scores, knowledge retention, and satisfaction.</td>
<td>1.277</td>
<td>USA</td>
<td>To verify if student satisfaction and knowledge gains are equivalent with a medium-fidelity simulator such as VitalSim® and a high-fidelity simulator such as SimMan®, and if they provide more overall student and program access to simulation.</td>
<td>Undergraduate (Bachelor)</td>
<td>89</td>
<td>1st</td>
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<td>16</td>
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<td>King 2011</td>
<td>Teaching advanced cardiac life support protocols</td>
<td>1.372</td>
<td>USA</td>
<td>To compare the effectiveness of static simulation to high-fidelity simulation when teaching advanced cardiac life support guidelines</td>
<td>Undergraduate (Bachelor)</td>
<td>49</td>
<td>4th</td>
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<td>17</td>
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<td>Lapkin 2011</td>
<td>A cost-utility analysis of medium vs. high-fidelity human patient simulation manikins in nursing education.</td>
<td>1.214</td>
<td>Australia</td>
<td>To determine whether the extra costs associated with high-fidelity manikins can justify the differences, if any, in the outcomes of clinical reasoning, knowledge acquisition and student satisfaction.</td>
<td>Undergraduate (Bachelor)</td>
<td>352</td>
<td>3rd</td>
<td>299 (85.0)</td>
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<td>18</td>
<td>26</td>
<td>Lee 2016</td>
<td>Effects of high-fidelity patient simulation led clinical reasoning course: Focused on nursing core competencies, problem solving, and academic self-efficacy.</td>
<td>0.554</td>
<td>South Korea</td>
<td>To examine effects of high-fidelity patient simulation (HFPS) led clinical reasoning course among undergraduate nursing students.</td>
<td>Undergraduate (Bachelor)</td>
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<td>4th</td>
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<td>k</td>
<td>IF</td>
<td>Year</td>
<td>n</td>
<td>Estimates</td>
<td>Country</td>
<td>Study Title</td>
<td>Design</td>
<td><em>p</em></td>
<td>SD</td>
<td>Sample Size</td>
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<td>25</td>
<td>0.33</td>
<td>2017</td>
<td>1.77</td>
<td>South Korea</td>
<td>Educational outcomes were compared between groups that received education through simulation combined with pre-education, simulation alone, and preeducation alone.</td>
<td>Undergraduate (Bachelor)</td>
<td>87</td>
<td>43</td>
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<td>nd</td>
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<td>20a</td>
<td>28</td>
<td>1.06</td>
<td>2010</td>
<td>1.04</td>
<td>Singapore</td>
<td>To evaluate the integration of a simulation-based learning activity on nursing students' clinical crisis management performance in a problem-based learning (PBL) curriculum.</td>
<td>Undergraduate (Baccalaureate)</td>
<td>30 (a) 33 (b)</td>
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<td>20.0 (1.0)</td>
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<td>20b</td>
<td>29</td>
<td>1.533</td>
<td>2012</td>
<td>0.56</td>
<td>Canada</td>
<td>To investigate learners' satisfaction, self-efficacy and performance behaviors among high-fidelity human simulators (HFPS), standardized patients (SP) and community volunteers (CV).</td>
<td>Undergraduate (Bachelor)</td>
<td>30 (a) 28 (b)</td>
<td>2nd</td>
<td>nd</td>
<td>nd</td>
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<td>21a</td>
<td>30</td>
<td>1.277</td>
<td>2014</td>
<td>0.43</td>
<td>UK</td>
<td>To evaluate the effectiveness of clinical simulation compared to classroom teaching in the assessment of the deteriorating patient.</td>
<td>Undergraduate (Bachelor)</td>
<td>34</td>
<td>1st</td>
<td>nd</td>
<td>nd</td>
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<tr>
<td>21b</td>
<td>31</td>
<td>0.04</td>
<td>2012</td>
<td>0.56</td>
<td>USA</td>
<td>To evaluate the effects of brief monthly refresher training on CPR skill retention, confidence, and satisfaction with CPR skill level of nursing students.</td>
<td>Undergraduate (Baccalaureate)</td>
<td>341</td>
<td>1st</td>
<td>nd</td>
<td>nd</td>
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<td>22</td>
<td>32</td>
<td>1.277</td>
<td>2013</td>
<td>1.06</td>
<td>USA</td>
<td>To analyze the immediate and long-term impact on students' perception of clinical competence after high-fidelity simulation.</td>
<td>Undergraduate (Baccalaureate)</td>
<td>95</td>
<td>1st</td>
<td>nd</td>
<td>nd</td>
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<td>23</td>
<td>33</td>
<td>0.56</td>
<td>2012</td>
<td>0.615</td>
<td>USA</td>
<td>To assess if HPS technology leads to greater clinical decision-making ability and clinical performance compared to the teaching modality of a paper and pencil case study.</td>
<td>Undergraduate (Baccalaureate)</td>
<td>133</td>
<td>na</td>
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<td>117 (88.0)</td>
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<td>24</td>
<td>34</td>
<td>0.615</td>
<td>2009</td>
<td>1.301</td>
<td>South Korea</td>
<td>To determine subjects' educational outcomes through videos of subjects performing a simulated cardiac arrest after the conclusion of the course.</td>
<td>Undergraduate (Baccalaureate)</td>
<td>163</td>
<td>2nd</td>
<td>IG 22.4 (5.9)</td>
<td>CG 21.3 (4.0)</td>
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<td>25</td>
<td>35</td>
<td>0.04</td>
<td>2012</td>
<td>1.301</td>
<td>South Korea</td>
<td>To assess the difference in pre- and post-test self-efficacy after simulation training and to compare differences in between nursing students exposed to medium- or high-fidelity patient simulations.</td>
<td>Undergraduate (Baccalaureate)</td>
<td>163</td>
<td>2nd</td>
<td>IG 22.4 (5.9)</td>
<td>CG 21.3 (4.0)</td>
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<td>26</td>
<td>36</td>
<td>1.301</td>
<td>2007</td>
<td>1.755</td>
<td>USA</td>
<td>To compare the efficacy of controlled simulation mannequin (SM) assisted learning and case study presentation on knowledge and confidence of nurse practitioner (NP) students in managing a cardiac event.</td>
<td>Postgraduate (Acute Care Nurse Practitioner, Adult Nurse Practitioner)</td>
<td>23</td>
<td>na</td>
<td>nd</td>
<td>nd</td>
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<td>27</td>
<td>37</td>
<td>1.277</td>
<td>2014</td>
<td>1.75</td>
<td>USA</td>
<td>To demonstrate self-efficacy and knowledge gain in subjects who participated in high-fidelity simulation.</td>
<td>Undergraduate (Baccalaureate)</td>
<td>161</td>
<td>4th</td>
<td>25.7 (nd)</td>
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<td>28</td>
<td>38</td>
<td>1.755</td>
<td>2012</td>
<td>1.313</td>
<td>Turkey</td>
<td>To compare the new HFHS experience with in-person and online student groups using the same case.</td>
<td>Undergraduate (Baccalaureate)</td>
<td>33 (a) 26 (b)</td>
<td>3rd</td>
<td>nd</td>
<td>nd</td>
</tr>
<tr>
<td>29</td>
<td>39</td>
<td>1.313</td>
<td>2014</td>
<td>2.533</td>
<td>Jordan</td>
<td>To evaluate the effect of simulation-based teaching on acquisition and retention of arrhythmia-related knowledge among nursing students.</td>
<td>Undergraduate (Bachelor)</td>
<td>91</td>
<td>4th</td>
<td>20.4 (1.0)</td>
<td>56 (61.5)</td>
</tr>
<tr>
<td>30a</td>
<td>40</td>
<td>2.533</td>
<td>2016</td>
<td>0.33 (a)</td>
<td>Turkey</td>
<td>To compare the effects of using high-fidelity simulators and standardized patients on the thorax, lung, and cardiac examination skills of undergraduate nursing students.</td>
<td>Undergraduate (Baccalaureate)</td>
<td>52</td>
<td>1st</td>
<td>23.0 (nd)</td>
<td>46 (88.5)</td>
</tr>
<tr>
<td>30b</td>
<td>41</td>
<td>0.33 (a)</td>
<td>2013</td>
<td>1.277</td>
<td>USA</td>
<td>To compare the effectiveness of two instructional methods (traditional classroom method and high-fidelity simulator method) to teach content related to distributive shock.</td>
<td>Undergraduate (Baccalaureate)</td>
<td>54</td>
<td>nd</td>
<td>nd</td>
<td>IG 16 (100.0)</td>
</tr>
</tbody>
</table>

n = number of studies; k = number of estimates; IF = Impact Factor; N = sample size; Year = academic year attended;
### Table C: Coding protocol for data extraction

<table>
<thead>
<tr>
<th>Study (n), Scenario</th>
<th>Tool</th>
<th>Experimental</th>
<th>Control</th>
<th>N (IG /CG)</th>
<th>IG</th>
<th>CG</th>
<th>Statistical test</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objectively-evaluated Knowledge (n = 12, k = 13)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[1] Cardiac arrest</td>
<td>14-item Multiple-choice [AHA, 2005c]</td>
<td>Laerdal SimMan®</td>
<td>No intervention</td>
<td>32/33</td>
<td>12.25 (1.22)</td>
<td>11.52 (1.15)</td>
<td>F test</td>
<td>0.015</td>
</tr>
<tr>
<td>[3] Cardiac arrest</td>
<td>12-item Multiple-choice [AHA, 2010]</td>
<td>METI™ version 6</td>
<td>Static half-torso manikin (Low-fidelity manikin)</td>
<td>52/58</td>
<td>9.10 (nd)</td>
<td>8.60 (nd)</td>
<td>Independent t-test</td>
<td>0.1</td>
</tr>
<tr>
<td>[5] Cardiac arrest</td>
<td>14-item Multiple-choice [AHA, 2010]</td>
<td>METI™</td>
<td>Low-fidelity manikin</td>
<td>45/45</td>
<td>12.67 (1.06)</td>
<td>11.22 (0.90)</td>
<td>Independent t-test</td>
<td>≤0.001</td>
</tr>
<tr>
<td>[11] Preeclampsia</td>
<td>10-item Multiple-choice</td>
<td>HFPS</td>
<td>Laerdal vSim® (Medium-fidelity manikin)</td>
<td>42/42</td>
<td>4.80 (1.19)</td>
<td>4.12 (1.54)</td>
<td>Independent t-test</td>
<td>0.09</td>
</tr>
<tr>
<td>[12] Respiratory failure</td>
<td>12-item Multiple-choice</td>
<td>Laerdal SimMan®</td>
<td>Web-based learning</td>
<td>10/10</td>
<td>9.20 (1.30)</td>
<td>9.10 (1.70)</td>
<td>Independent t-test</td>
<td>0.891</td>
</tr>
<tr>
<td>[14a] Bronchiolitis</td>
<td>20-item Dichotomous</td>
<td>HFPS</td>
<td>Problem-based learning</td>
<td>62/69</td>
<td>0.86 (0.07)</td>
<td>0.83 (0.07)</td>
<td>nd</td>
<td>nd</td>
</tr>
<tr>
<td>[14b] Bronchiolitis</td>
<td>20-item Dichotomous</td>
<td>HFPS</td>
<td>Lecture</td>
<td>62/74</td>
<td>0.86 (0.07)</td>
<td>0.78 (0.11)</td>
<td>nd</td>
<td>nd</td>
</tr>
<tr>
<td>[19] Pulmonary edema</td>
<td>10-item Dichotomous</td>
<td>Laerdal SimMan®</td>
<td>Lecture</td>
<td>45/42</td>
<td>5.31 (1.29)</td>
<td>5.21 (1.47)</td>
<td>ANOVA</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>[26] Cardiac arrest</td>
<td>ACLS Written Examination [AHA]</td>
<td>Laerdal SimMan®</td>
<td>Low-fidelity manikin</td>
<td>16/18</td>
<td>90.00 (7.59)</td>
<td>87.78 (9.05)</td>
<td>Mann-Whitney U test</td>
<td>0.447</td>
</tr>
<tr>
<td>[29] Heart failure, Pulmonary edema</td>
<td>12-item Multiple-choice HF Clinical Knowledge</td>
<td>Laerdal SimMan®</td>
<td>No intervention</td>
<td>89/72</td>
<td>61.39 (12.71)</td>
<td>55.47 (14.77)</td>
<td>Nd</td>
<td>nd</td>
</tr>
<tr>
<td>[31] Arrhythmia</td>
<td>20-item Multiple-choice [AHA, 2010]</td>
<td>METI™ version 6</td>
<td>Lecture</td>
<td>47/44</td>
<td>11.20 (3.35)</td>
<td>7.60 (2.36)</td>
<td>Independent t-test</td>
<td>≤0.001</td>
</tr>
<tr>
<td>[32] Intensive care</td>
<td>22-item Multiple-choice</td>
<td>HFPS</td>
<td>Standardized patient</td>
<td>26/26</td>
<td>72.79 (9.13)</td>
<td>73.80 (11.28)</td>
<td>Nd</td>
<td>nd</td>
</tr>
<tr>
<td>[33] Shock</td>
<td>10-item Multiple-choice Distributive Shock Questionnaire (DSQ)</td>
<td>HFPS</td>
<td>Lecture</td>
<td>16/38</td>
<td>6.75 (1.61)</td>
<td>7.82 (1.45)</td>
<td>ANOVA</td>
<td>&lt;0.03</td>
</tr>
<tr>
<td><strong>Objectively-evaluated Performance (n = 14, k = 21)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[1] Cardiac arrest</td>
<td>BLS for Healthcare Provider Course Final Evaluation Skills Sheet for Adult CPR [AHA, 2001]</td>
<td>Laerdal SimMan®</td>
<td>No intervention</td>
<td>32/33</td>
<td>11.19 (0.78)</td>
<td>11.36 (1.27)</td>
<td>F test</td>
<td>0.000</td>
</tr>
<tr>
<td>[4a] Intensive care #1</td>
<td>Ad-hoc</td>
<td>Laerdal SimMan®</td>
<td>No intervention</td>
<td>49/50</td>
<td>47.54 (8.46)</td>
<td>48.82 (10.26)</td>
<td>nd</td>
<td>nd</td>
</tr>
<tr>
<td>[4b] Intensive care #2</td>
<td>Ad-hoc</td>
<td>Laerdal SimMan®</td>
<td>No intervention</td>
<td>49/50</td>
<td>61.71 (7.53)</td>
<td>56.00 (9.46)</td>
<td>nd</td>
<td>nd</td>
</tr>
<tr>
<td>[5] Cardiac arrest</td>
<td>AHA BLS for Healthcare Provider Course Final Evaluation Skills Sheet for Adult CPR [AHA, 2005c]</td>
<td>METI™</td>
<td>Low-fidelity manikin</td>
<td>45/45</td>
<td>13.13 (1.01)</td>
<td>11.58 (1.63)</td>
<td>Independent t-test</td>
<td>≤0.001</td>
</tr>
<tr>
<td>[7a] Cardiac arrest, Pulmonary embolism, COPD</td>
<td>7-item Likert-type</td>
<td>HFPS</td>
<td>No intervention</td>
<td>11/6</td>
<td>5.04 (0.48)</td>
<td>3.64 (1.22)</td>
<td>ANOVA</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>[7b] Cardiac arrest, Pulmonary embolism, COPD</td>
<td>7-item Likert-type</td>
<td>HFPS</td>
<td>Video-watching</td>
<td>11/10</td>
<td>5.04 (0.48)</td>
<td>4.74 (0.88)</td>
<td>ANOVA</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>[6] Cardiac arrest</td>
<td>20-item Acute Myocardial Infarction Questionnaire (AMIQ)</td>
<td>METI™</td>
<td>Lecture</td>
<td>54/53</td>
<td>15.58 (2.13)</td>
<td>14.17 (1.86)</td>
<td>Independent t-test</td>
<td>0.002</td>
</tr>
<tr>
<td>[9b] Dysrhythmias</td>
<td>30-item Multiple-choice ECG SimTest [Morrison, 2006]</td>
<td>Laerdal SimMan®</td>
<td>Lecture</td>
<td>70/70</td>
<td>1008.00 (nd)</td>
<td>1070.00 (nd)</td>
<td>Independent t-test</td>
<td>0.143</td>
</tr>
<tr>
<td>[10a] Heart failure</td>
<td>7-item Likert-type</td>
<td>METI BabySIM®</td>
<td>Audio-listening</td>
<td>21/21</td>
<td>3.41 (0.33)</td>
<td>3.71 (0.30)</td>
<td>nd</td>
<td>nd</td>
</tr>
<tr>
<td>[10b] Heart failure</td>
<td>7-item Likert-type</td>
<td>METI BabySIM®</td>
<td>No intervention</td>
<td>21/12</td>
<td>3.16 (0.35)</td>
<td>3.23 (0.35)</td>
<td>nd</td>
<td>nd</td>
</tr>
<tr>
<td>[10c] Pneumothorax</td>
<td>7-item Likert-type</td>
<td>METI BabySIM®</td>
<td>Audio-listening</td>
<td>21/21</td>
<td>3.39 (0.32)</td>
<td>3.50 (0.29)</td>
<td>nd</td>
<td>nd</td>
</tr>
<tr>
<td>[10d] Pneumothorax</td>
<td>7-item Likert-type</td>
<td>METI PediaSIM®</td>
<td>No intervention</td>
<td>21/12</td>
<td>3.39 (0.32)</td>
<td>3.60 (0.34)</td>
<td>Nd</td>
<td>Nd</td>
</tr>
<tr>
<td>[13] Bronchiolitis, Dehydration, Respiratory distress</td>
<td>RN Nursing Care of Children Content Mastery Test [Assessment Technologies Institute, 2008]</td>
<td>Laerdal SimBaby™</td>
<td>METI PediaSIM®</td>
<td>No intervention</td>
<td>55/16</td>
<td>65.33 (6.86)</td>
<td>67.46 (8.45)</td>
<td>Independent t-test</td>
</tr>
<tr>
<td>[16] Cardiac arrest</td>
<td>25-item Multiple-choice [AHA, 2006]</td>
<td>Laerdal SimMan®</td>
<td>Low-fidelity manikin</td>
<td>24/25</td>
<td>22 (92.00%)</td>
<td>23 (93.00%)</td>
<td>nd</td>
<td>nd</td>
</tr>
<tr>
<td>[20a] Respiratory distress</td>
<td>Dichotomous</td>
<td>Laerdal SimMan®</td>
<td>Problem-based learning</td>
<td>13/17</td>
<td>20.08 (1.93)</td>
<td>18.19 (2.55)</td>
<td>Independent t-test</td>
<td>0.034</td>
</tr>
<tr>
<td>[20b] Cardiac arrest</td>
<td>Dichotomous</td>
<td>Laerdal SimMan®</td>
<td>Problem-based learning</td>
<td>18/15</td>
<td>37.56 (2.15)</td>
<td>37.07 (2.69)</td>
<td>Independent t-test</td>
<td>0.00</td>
</tr>
<tr>
<td>[21a] Asthma exacerbation</td>
<td>47-item Dichotomous Respiratory Assessment Checklist</td>
<td>HFPS</td>
<td>Role-play</td>
<td>14/16</td>
<td>32.90 (4.20)</td>
<td>28.90 (4.50)</td>
<td>nd</td>
<td>nd</td>
</tr>
<tr>
<td>[21b] Asthma exacerbation</td>
<td>17-item Likert-type Health Assessment Educational Modality Evaluation (HAEME)</td>
<td>HFPS</td>
<td>Standardized patient</td>
<td>14/14</td>
<td>32.90 (4.20)</td>
<td>27.40 (4.90)</td>
<td>nd</td>
<td>nd</td>
</tr>
<tr>
<td>[22] Intensive care</td>
<td>24-item Dichotomous</td>
<td>HFPS</td>
<td>Lecture</td>
<td>15/19</td>
<td>19.00 (3.20)</td>
<td>16.00 (3.70)</td>
<td>nd</td>
<td>nd</td>
</tr>
<tr>
<td>[25] Cardiac arrest</td>
<td>Nd</td>
<td>Laerdal SimMan®</td>
<td>Lecture</td>
<td>66/67</td>
<td>69.70 (12.20)</td>
<td>61.60 (13.70)</td>
<td>Independent t-test</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>[26] Cardiac arrest</td>
<td>ACLS Mega Code Performance Score Sheet [AHA]</td>
<td>Laerdal SimMan®</td>
<td>Low-fidelity manikin</td>
<td>16/18</td>
<td>73.60 (17.70)</td>
<td>64.60 (15.60)</td>
<td>nd</td>
<td>nd</td>
</tr>
</tbody>
</table>

Self-rated Satisfaction with simulation (n = 10, k = 13)
[6] Hypovolemic shock, Bradycardia, Pneumonia, Pulmonary edema
17-item Likert-type Satisfaction with Clinical Experience Simulation Scale (SCESS)
Laerdal Resusci Anne with iStan®
Laerdal Resusci Anne with VitalSim® (Medium-fidelity manikin)
49/36 89.37 (6.18) 84.88 (6.98) nd nd

[12] Respiratory failure
5-item Likert-type
Laerdal SimMan®
Web-based learning
10/10 24.6 (0.97) 19.3 (2.90) Independent t-test <0.0001

[14a] Bronchiolitis
18-item Likert-type Satisfaction with Simulation Experience Scale (SSE)
HPPS
Problem-based learning
62/69 4.17 (0.53) 4.67 (0.39) nd nd

[14b] Bronchiolitis
20-item Dichotomous
HPPS
Lecture
62/74 4.17 (0.53) 3.48 (0.62) nd nd

[15] Cardiac arrest
7-item Likert-type
Laerdal SimMan®
Laerdal VitalSim® (Medium-fidelity manikin)
45/44 4.58 (0.44) 4.50 (0.48) nd nd

[17] Hypervolemia, Pulmonary edema
18-item Likert-type Satisfaction with Simulation Experience Scale (SSE)
Laerdal SimMan®
MegaCode Kelly™ with VitalSim™ (Medium-fidelity manikin)
352/45 4.15 (0.37) 4.42 (0.42) Independent t-test 0.546

[19] Pulmonary edema
9-item Likert-type [Otieno, 2007]
Laerdal SimMan®
Lecture
45/42 3.39 (0.42) 3.03 (0.36) ANOVA <0.001

[21a] Asthma exacerbation
17-item Likert-type Health Assessment Educational Modality Evaluation (HAEME)
HPPS
Role-play
14/16 40.86 (6.71) 46.38 (5.97) nd nd

[21b] Asthma exacerbation
17-item Likert-type Health Assessment Educational Modality Evaluation (HAEME)
HPPS
Standardized patient
14/14 40.86 (6.71) 41.00 (12.20) nd nd

[22] Cardiac arrest
5-item Likert-type
HPPS
Lecture
165/176 153/12 156/20 nd nd

[28] Cardiac arrest
6-item Likert-type Open-ended Evaluation Instrument
Med Sim-Eagle
Lecture
13/10 2.85 (0.39) 2.85 (0.42) Independent t-test 0.784

[30a] Cardiac arrest
1-item Likert-type
HPPS
Lecture
16/17 4.50 (0.73) 4.20 (0.75) nd nd

[30b] Cardiac arrest
1-item Likert-type
HPPS
Web-based learning
16/10 4.50 (0.73) 3.60 (0.52) nd nd

Self-rated Self-confidence (n = 15, k = 18)

[2a] Pneumonia
Ad-hoc
METI™
Lecture
35/34 4.05 (0.48) 3.86 (0.53) ANOVA 0.034

[2b] Increased intracranial pressure
Ad-hoc
METI™
Lecture
35/34 3.37 (0.41) 3.56 (0.34) ANOVA 0.093

[3] Cardiac arrest
17-item [Arnold, 2009]
METI™ version 6
Static half-torso manikin (Low-fidelity manikin)
52/58 Student t = 3.91 Independent t-test 0.001

[4c] Intensive care
Likert-type
Laerdal SimMan®
No intervention
49/50 3.40 (0.80) 3.50 (1.00) Mann-Whitney 0.819

[6] Hypovolemic shock, Bradycardia, Pneumonia, Pulmonary edema
26-item Likert-type Gains Perceived with High-fidelity Simulation Scale (GPHSS) [Baptista, 2013]
Laerdal Resusci Anne with iStan®
Laerdal Resusci Anne with VitalSim® (Medium-fidelity manikin)
49/36 80.73 (7.03) 78.73 (4.76) nd nd

[8] Cardiac arrest
34-item Confidence Level (CL) [Madorin, 1999]
METI™
Lecture
54/53 106.29 (19.71) 113.51 (17.47) Independent t-test 0.09

27-item Likert-type Nursing Anxiety and Self-Confidence with Clinical Decision-Making Scale (NASC-CDM)
HPPS
Laerdal 'sSim® (Medium-fidelity manikin)
42/42 115.25 (21.95) 104.39 (17.52) Independent t-test 0.059

[14a] Bronchiolitis
27-item Likert-type
HPPS
Problem-based learning
62/69 3.57 (0.33) 3.69 (0.30) nd nd

[14b] Bronchiolitis
20-item Dichotomous
HPPS
Lecture
62/74 3.57 (0.33) 3.38 (0.44) nd nd

[18] Cardiac arrest
70-item Likert-type Nursing core competencies measurement tool [Lee, 2011]
Laerdal SimMan®
No intervention
23/26 256.47 (32.33) 247.26 (23.17) Fisher’s exact test 0.008

[19] Pulmonary edema
13-item Likert-type
Laerdal SimMan®
Lecture
45/42 4.06 (0.47) 3.82 (0.55) ANOVA 0.011

[21a] Asthma exacerbation
17-item Likert-type Health Assessment Educational Modality Evaluation (HAEME)
HPPS
Role-play
14/16 3.50 (0.94) 4.31 (1.01) nd nd

[21b] Asthma exacerbation
17-item Likert-type Health Assessment Educational Modality Evaluation (HAEME)
HPPS
Standardized patient
14/14 3.50 (0.94) 4.21 (0.70) nd nd

[22] Intensive care
33-item Likert-type Nursing Competencies Questionnaire [Bartlett, 1998]
HPPS
Lecture
15/19 84.40 (1.20) 81.21 (2.70) Mann-Whitney U test <0.01

[23] Cardiac arrest
5-item Likert-type
HPPS
Lecture
165/176 146/19 * 136/40 * nd nd

[24] Intensive care
5-item Likert-type
HPPS
No intervention
64/31 20.31 (2.13) 18.65 (2.65) Independent t-test <0.001

[29] Heart failure, Pulmonary edema
3-item Likert-type [Ravert, 2004]
Laerdal SimMan®
No intervention
89/72 2.47 (0.86) 2.08 (0.97) nd nd

[33] Shock
34-item Likert-type [Madorin, 1999]
HPPS
Lecture
16/38 111.38 (16.27) 108.26 (14.55) nd >0.05

Self-rated Self-efficacy (n = 4, k = 5)

[18] Cardiac arrest
28-question Likert-type Academic self-efficacy tool [Kim, 2001]
Laerdal SimMan®
No intervention
23/26 114.83 (13.90) 110.19 (13.15) Fisher’s exact test 0.167

[21a] Asthma exacerbation
17-item Likert-type Health Assessment Educational Modality Evaluation (HAEME)
HPPS
Role-play
14/16 18.79 (4.17) 21.63 (3.30) nd nd

[21b] Asthma exacerbation
17-item Likert-type Health Assessment Educational Modality Evaluation (HAEME)
HPPS
Standardized patient
14/14 18.79 (4.17) 19.50 (3.01) nd nd
Table D - List of study design feature checking (studies with allocation to interventions at the individual level)

| Items | N | [1] | [2] | [3] | [4] | [5] | [6] | [7] | [8] | [9] | [10] | [11] | [12] | [13] | [14] | [15] | [16] | [17] | [18] | [19] | [20] | [21] | [22] | [23] | [24] | [25] | [26] | [27] | [28] | [29] | [30] | [31] | [32] | [33] |
|-------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| a1    | N | N   | N   | N   | N   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   |
| a2    | N | N   | Y   | Y   | Y   | Y   | N   | N   | N   | Y   | Y   | Y   | Y   | N   | N   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   | Y   |
| b1    | N | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   |
| b2    | N | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   |
| b3    | N | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   |
| b4    | N | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   |
| b5    | N | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   |
| b6    | N | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   |
| b7    | N | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   |
| b8    | N | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   | N   |

Notes: Was there a comparison: (a) [between two or more groups of participants receiving different interventions? (a1)], [within the same group of participants over time? (a2)]. Were participants allocated to groups by: (b) [concealed randomization? (b1)], [quasi-randomization? (b2)], [by other action of researchers? (b3)], [time differences? (b4)], [location differences? (b5)], [treatment decisions? (b6)], [participants’ preferences? (b7)], [based on outcome? (b8)]. Which parts of the study were prospective? (c) [identification of participants? (c1)], [assessment of baseline and allocation to intervention? (c2)], [generation of hypotheses? (c3)]. On what variables was comparability between groups assessed: (d) [potential confounders? (d1)], [baseline assessment of outcome variables? (d2)].

Y: yes; N: no; P: possible; RCT: randomized controlled trial; Q-RCT: quasi-RCT; NRCT: non-RCT; CBA: controlled before-after.

Note: studies in the first column are labeled with the corresponding number exhibited in the previous ‘Description of included studies’.
| Items | 1.1 | 1.2 | 1.3 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | 2.7 | 2.8 | 2.9 | 3.1 | 3.2 | 3.3 | 3.4 | 3.5 | 3.6 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 4.6 | EV | IV |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1     | -   | -   | +   | ++  | -   | -   | +   | ++  | -   | -   | +   | +   | +   | +   | +   | +   | +   | -   | -   | -   | +   | +   | -   | +   |   |   |
| 2     | ++  | -   | -   | +   | +   | +   | +   | +   | +   | -   | +   | +   | +   | +   | +   | +   | +   | +   | -   | +   | +   | +   | -   | +   |   |   |
| 3     | ++  | ++  | +   | ++  | +   | +   | ++  | +   | ++  | -   | +   | +   | +   | +   | +   | -   | +   | +   | -   | +   | +   | +   | -   | +   |   |   |
| 4     | ++  | ++  | ++  | +   | +   | +   | +   | +   | +   | -   | +   | +   | +   | +   | +   | -   | +   | +   | -   | +   | +   | +   | -   | +   |   |   |
| 5     | ++  | ++  | ++  | +   | +   | -   | +   | ++  | +   | -   | +   | +   | +   | +   | +   | -   | +   | +   | -   | +   | +   | +   | -   | +   |   |   |
| 6     | ++  | -   | ++  | +   | -   | +   | ++  | +   | ++  | -   | +   | +   | +   | +   | +   | +   | +   | +   | -   | +   | +   | +   | -   | +   |   |   |
| 7     | -   | -   | ++  | -   | -   | +   | ++  | +   | ++  | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   |   |   |
| 8     | ++  | +   | +   | -   | -   | -   | ++  | +   | ++  | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   |   |   |
| 9     | ++  | -   | +   | -   | -   | -   | +   | ++  | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | -   | -   | +   | +   | +   | +   |   |   |
| 10    | -   | -   | +   | +   | -   | +   | ++  | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   |   |   |
| 11    | ++  | -   | -   | +   | +   | -   | +   | ++  | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   |   |   |
| 12    | +   | +   | +   | +   | -   | +   | ++  | +   | ++  | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   |   |   |
| 13    | -   | -   | +   | +   | -   | +   | ++  | +   | ++  | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   |   |   |
| 14    | -   | ++  | ++  | +   | -   | -   | +   | ++  | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   |   |   |
| 15    | -   | +   | +   | +   | -   | -   | +   | ++  | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   |   |   |
| 16    | -   | -   | +   | +   | -   | +   | ++  | +   | ++  | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   |   |   |
| 17    | +   | -   | +   | +   | -   | -   | +   | ++  | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   |   |   |
| 18    | -   | +   | +   | -   | -   | -   | +   | ++  | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   |   |   |
| 19    | +   | -   | -   | +   | -   | -   | +   | ++  | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   |   |   |
| 20    | +   | -   | -   | ++  | -   | -   | +   | ++  | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   |   |   |
| 21    | -   | -   | +   | -   | -   | -   | +   | ++  | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   |   |   |
| 22    | -   | -   | ++  | ++  | -   | -   | +   | ++  | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   |   |   |
| 23    | ++  | -   | +   | -   | -   | +   | ++  | +   | +   | -   | -   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   |   |   |
| 24    | -   | -   | +   | -   | -   | +   | ++  | +   | +   | -   | -   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   |   |   |
| 25    | ++  | +   | +   | -   | -   | +   | ++  | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   |   |   |
| 26    | ++  | -   | -   | -   | -   | +   | ++  | +   | ++  | -   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   |   |   |
| 27    | ++  | ++  | ++  | -   | -   | -   | +   | ++  | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   |   |   |
| 28    | -   | +   | +   | ++  | -   | -   | +   | ++  | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   |   |   |
| 29    | ++  | ++  | ++  | +   | -   | +   | ++  | +   | ++  | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   |   |   |
| 30    | -   | -   | +   | +   | -   | -   | +   | ++  | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   |   |   |
| 31    | ++  | +   | +   | +   | -   | +   | ++  | +   | ++  | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   |   |   |
| 32    | ++  | -   | ++  | -   | -   | +   | ++  | +   | +   | -   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   |   |   |
| 33    | +   | ++  | ++  | +   | -   | -   | +   | ++  | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   |   |   |

na: not applicable; nr: not reported; EV: external validity; IV: internal validity.
Figure 2 - Funnel plot for self-efficacy