桌遊教學是否能提升新進護理師藥物認知的成效

引言人：簡美麗護理師/ 林淑惠護理長

報告日期：112年7月4日

動機

➢ 當要給予病患降鉀處理時，醫囑開立一大串.......，學姐也教我過，我該怎麼辦?

➢ 當病心律不整要給Adenocor，我二話不說直接給藥.......

➢ 常常詢問學姊藥物，得到的是「你怎不會?都來幾年了?」我該怎麼記得......

➢ 「你病人只是嘴破，你怎麼給他擦痔瘡藥膏?..等等」

➢ 高警訊藥物訓練之學習成效

背景-₁
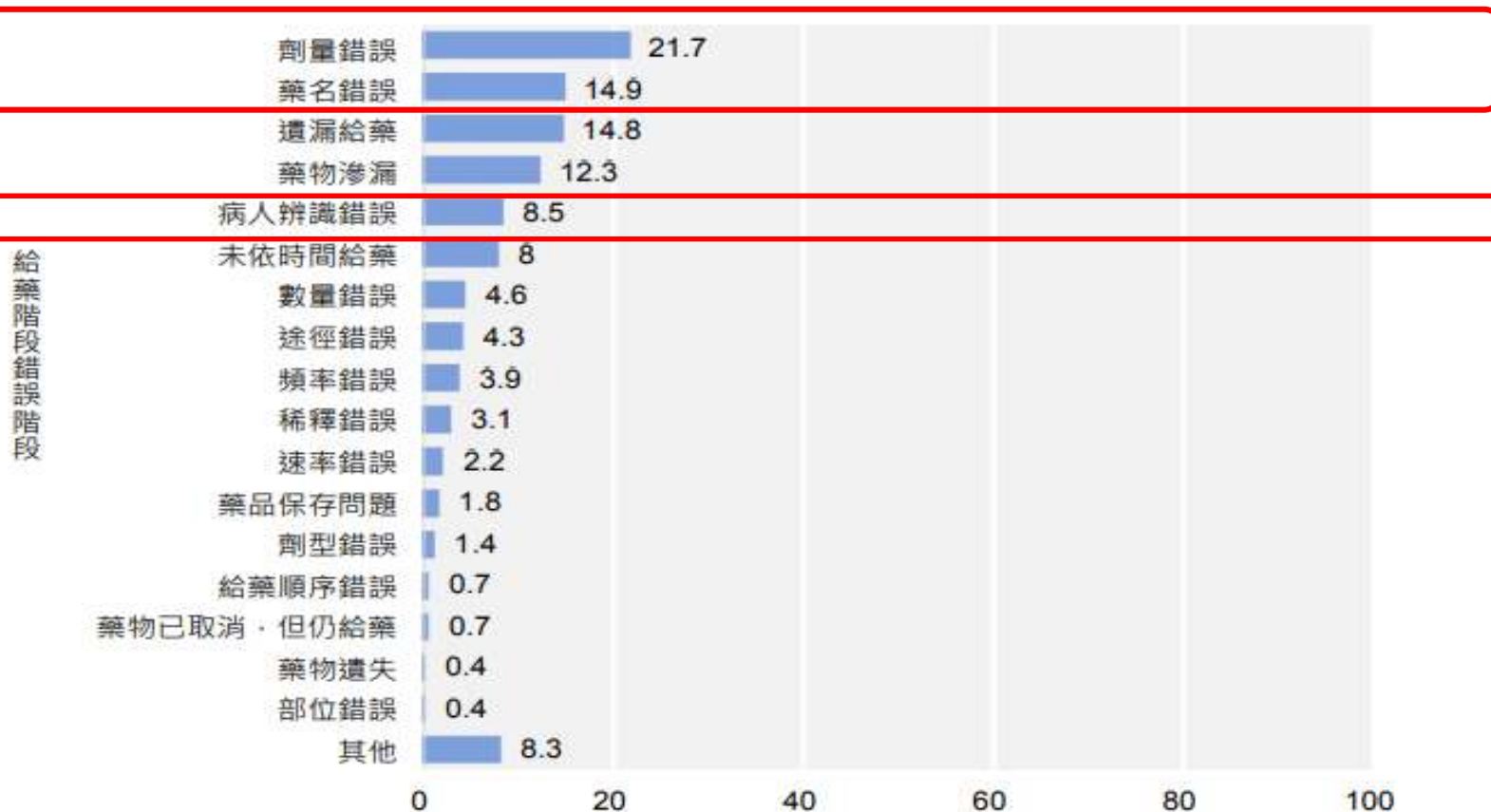
- 2022年衛生福利部指出，異常事件中以藥物事件所佔比例較高（28.2%）排名**第二位**，其中又以醫囑開立階段發生跡近錯誤為主因(佔62.8%)。

- 造成病人健康實質傷害，最常發生在給藥階段，而**護理人員是給藥階段最後**直接面對病人的環節把關者。

(衛生福利部，**2022**)

背景-2

醫院藥物事項給藥錯誤階段之錯誤項目明細如圖下:

(衛生福利部，2022)

背景-3

- 新進護理師透過醫療資訊系統及書本，來認識藥物藥理作用，但對給藥前須注意的臨床表徵及給藥後症狀評估等相關知識不足，容易造成藥物使用錯誤。

- 臨床上護理教學成效會直接影響護理人員對病人照護品質專業的承諾，人員不適當的態度或缺乏訓練，更是造成異常事件發生的主因，但態度的養成是教學者最艱難的挑戰。

(李等，2019)

遊戲式學習簡介 -1
（ game-based learning, GBL ）

*遊戲式學習是一種靈活應用故事性、競爭性及互動性等教學策略，來幫助學習者於遊戲過程進行判斷、應用和反饋，逐步加強學習者的學習動機，當學習動機越趨強烈，控制或維持外顯行為的態度將越強烈，這種「以學習者為中心」的創新教學方式，相較傳統講授課程（ lecture-based, LB ），更能激發學習者內在學習動機及行為改變的學習效果。

(李等，2019)

遊戲式學習簡介-2
（game-based learning, GBL）

- 遊戲式學習是運用遊戲化概念，設計一連串縝密的學習流程，將遊戲策略作為引導學習者學習的鷹架，透過精心設計的「遊戲機制」，提高學習者尋求獲勝的意願及動力，進而增強學習動機。

  (呂等，**2018)**

遊戲式學習簡介-3
（game-based learning, GBL）

- 嚴肅遊戲（serious game）是指「將數位遊戲應用在休閒娛樂之外的其他專業領域，譬如教育、醫學治療、宗教、政治 或軍事等層面」，設計容易理解課程內容的互動多媒體遊戲教材，將教材的文字閱讀頁面簡化，利用角色扮演遊戲（Role-Playing Game, RPG）的方式呈現課程內容，學員依照教師講解，並親自操作多媒體教材的遊戲進行學習，減緩閱讀紙本教科書大量文字的壓力感，藉由互動遊戲及圖像學習課程知識。

(李等，2019)

遊戲式學習簡介-3
（game-based learning, GBL）

- 文獻指出數位遊戲不再只是休閒消遣的工具，因數位角色與情境之遊戲教材的互動性、趣味性與極具吸引力的特性，若將知識與教育帶進遊戲中，更能引起學習者興趣，進而**提高學習意願。**

- 研究指出，2000 年後的千禧世代學生透過新媒體（包含網路、單機遊戲、線上遊戲、部落格、Facebook、 Myspace 等等）發現、體驗、學習新**技術。** 此世代的學生喜好閱讀圖像豐富的動態文字，也明顯偏好積極與充滿活力的**新媒體技術**和**體驗式互動學習** 。

(陳等，**2016)**

遊戲式學習設計
（game-based learning, GBL）

- 遊戲設計:

（一）由於遊戲具有相當高的複雜度，操作時從最簡單的開始，慢慢按照遊戲所設定的順序逐步進階，從一個層次進步到另一個較高的層次，在這些層次的遞換中，當學習者獲得遊戲中給予的反饋，因此能給予學生立即的滿足。

（二）由於遊戲富有挑戰，而可經由**閱讀遊戲指引**或由**嘗試錯誤**去獲得遊戲的技巧，可滿足學習者好奇探險的精神。

（三）由於遊戲有趣好玩，又能學習新知，相對地學習者便覺得遊戲世界比現實世界更能獲得成就感，故加深對學習的成效進而運用在臨床照顧。

(張等，2021)

遊戲式學習優點
（ game-based learning, GBL ）

遊戲式學習的四項**優點**:

（１）**引發動機及提高興趣:**藉遊戲設計的故事脈絡，進行互動、
　　　競爭及概念傳遞，促進學習遷移，提高學習者學習興趣。
（２）**增強記憶:**運用遊戲進行循環式學習，將重複、背誦等枯燥
　　　學習過程，藉由挑戰性策略介入，保持學習興趣及積極參
　　　與性。
（３）**實作與反饋效果:**透過反覆操作練習，即時回饋，讓學習者
　　　於遊戲過程中隨時掌握學習進度，評估學習成效。
（４）**高層次思考 :**依學習者需求完成遊 戲設計，將教學內容融
　　　入於遊戲中，學習者可在遊戲 化的教學策略下，不斷地思
　　　考、決策及綜合判斷。

(李等，2019)

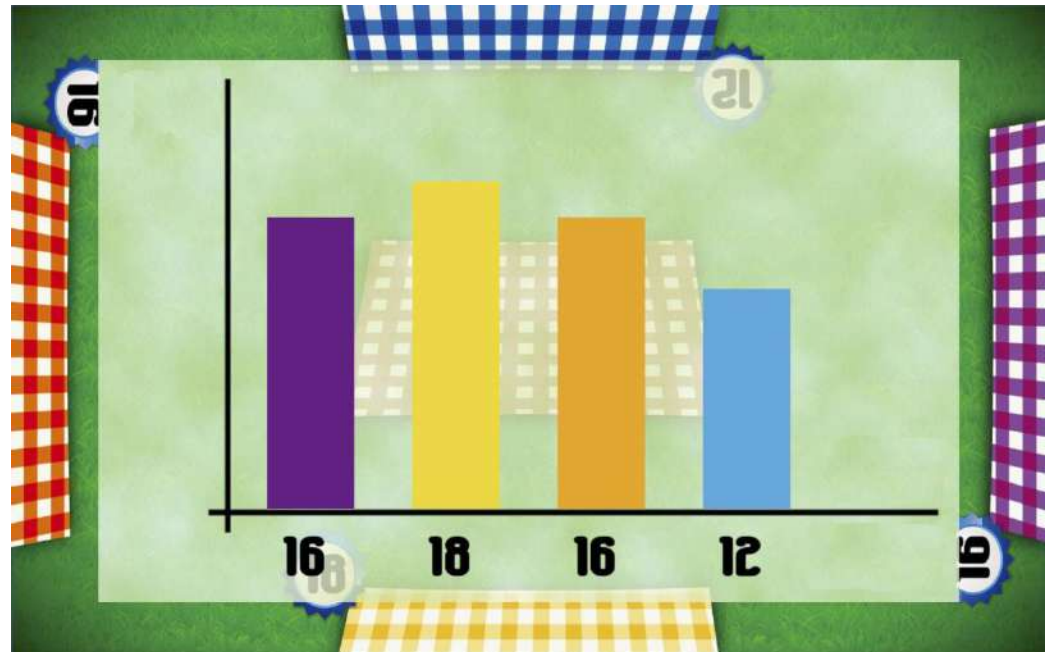# 臨床現況

當傳統方式及遊戲方式教學，你/妳的選擇?.........

Digital serious games in developing nursing clinical competence: A systematic review and meta-analysis

Dhivya P. Thangavelu a , Apphia J.Q. Tan b, Robyn Cant c , Wei Ling Chua b , Sok Ying Liaw b

Impact Factor:3.9(2022)

快速評讀[FAITH的工具]

FAITH tools

[Meta-analysis]

步驟1：研究探討的問題為何? **(PICO)**

步驟2：研究的品質如何? **(內在效度)**

步驟3：研究結果之意義為何? **(效益)**

步驟1: 文獻回顧探討問題為何？

P

- Nursing staff and Nursing students

I

- **game learning**

C

- general teaching

O

- Can it improve learning effectiveness(成效)

問題類型：●治療型　○預後型　○診斷型　○傷害型

臺北市立萬芳醫院
-委託財團法人臺北醫學大學辦理-

快速評讀[FAITH的工具]

FAITH tools

[Meta-analysis]

步驟1：研究探討的問題為何?　　(PICO)

步驟2：研究的品質如何?　　(內在效度)

　　　　　　　　　　　　　　　　(效益)

步驟3：研究結果之意義為何?

F (Find)—研究是否找到所有相關證據

of Nursing and Allied Health Literature (CINAHL), Embase, PsychInfo, Scopus, Web of Science, Cochrane Central Register of Controlled Trials and Education Resources Information Centre (ERIC). The idea of using gaming and the internet in healthcare education already existed before 2010 (Chaffin and Maddux, 2004; Skiba, 2008). Subsequently, the use of computer-based programmes in healthcare education started to pick up (Cook et al., 2010). Therefore, we widened the data parameters to ensure that as many relevant studies could be included as possible. Additionally, grey literature databases such as ProQuest Dissertations and Theses were scanned. Additional keywords were also selected through discussion with the research team and a search in relevant systematic reviews. The combination of search terms included: 'serious games', 'gamification', 'video games', 'electronic games', 'computer games', 'virtual games', 'nurses', 'nursing education', 'teaching', and 'education'. Search strategies for each database were developed accordingly to specific database recommendations with the use of Boolean operators (see Appendix B).

良好的文獻搜尋至少應
包括二個主要的資料庫
(如：Medline, Cochrane
考科藍實證醫學資料
庫, EMBASE 等)，並且加
上文獻引用檢索、試驗
登錄資料等。文獻搜尋
應不只限於英文，並且
應同時使用 MeSH 字串
及一般檢索詞彙。

A comprehensive search of literature from January 2000 to July 2021 was conducted using eight databases: PubMed, Cumulative Index of Nursing and Allied Health Literature (CINAHL), Embase, PsychInfo, Scopus, Web of Science, Cochrane Central Register of Controlled Trials and Education Resources Information Centre (ERIC). The idea of using gaming and the internet in healthcare education already existed before 2010 (Chaffin and Maddux, 2004; Skiba, 2008). Subsequently, the use of computer-based programmes in healthcare education started to pick up (Cook et al., 2010). Therefore, we widened the data parameters to ensure that as many relevant studies could be included as possible. Additionally, grey literature databases such as ProQuest Dissertations and Theses were scanned. Additional hand searching included relevant journals such as Clinical Simulation in Nursing, Nurse Education Today and Games for Health Journal, as well as the reference lists of relevant reviews. A list of index terms was identified after an initial search on the Medical Subject Headings (MeSH) database. The combination of search terms included:'serious games', 'gamification', 'video games', 'electronic games','computer games', 'virtual games', 'nurses', 'nursing education','teaching', and 'education'.

P.2

其中有PubMed、CINAHL、Embase、Web of Science、Medline和Cochrane圖書館等電子數據庫，搜尋自2000 年 1 月至 2021 年 7 月期間的文獻，並使用關鍵詞和MeSH術語進行搜索。

臺北市立萬芳醫院
·委託財團法人臺北醫學大學辦理·

F(Find)─研究是否找到所有相關證據 (納入及排除條件)

A three-step screening process was undertaken by researchers (DT and AT) to select the studies for inclusion. First, duplicates were removed. Next, DT and AT independently screened the titles and abstracts for appropriate studies. Last, articles selected were carefully reviewed in their full-text form independently by DT and AT. Any discrepancies in article selection between DT and AT were resolved through frequent discussion. If the disagreement between DT and AT could not be resolved, a third experienced reviewer (SY) was consulted. The studies were

1. selected if they met the following criteria:

1. Studies were randomized controlled trials (RCTs) and quasiexperimental studies (QETs).
2. Interventions were computer- or mobile-based and incorporated gaming design elements.
3. Interventions were compared with a non-intervention group or other forms of educational interventions including but not limited to flipped classrooms, simulations and traditional lectures.
4. Study populations consisted of nursing students or registered (trained/qualified) nurses.
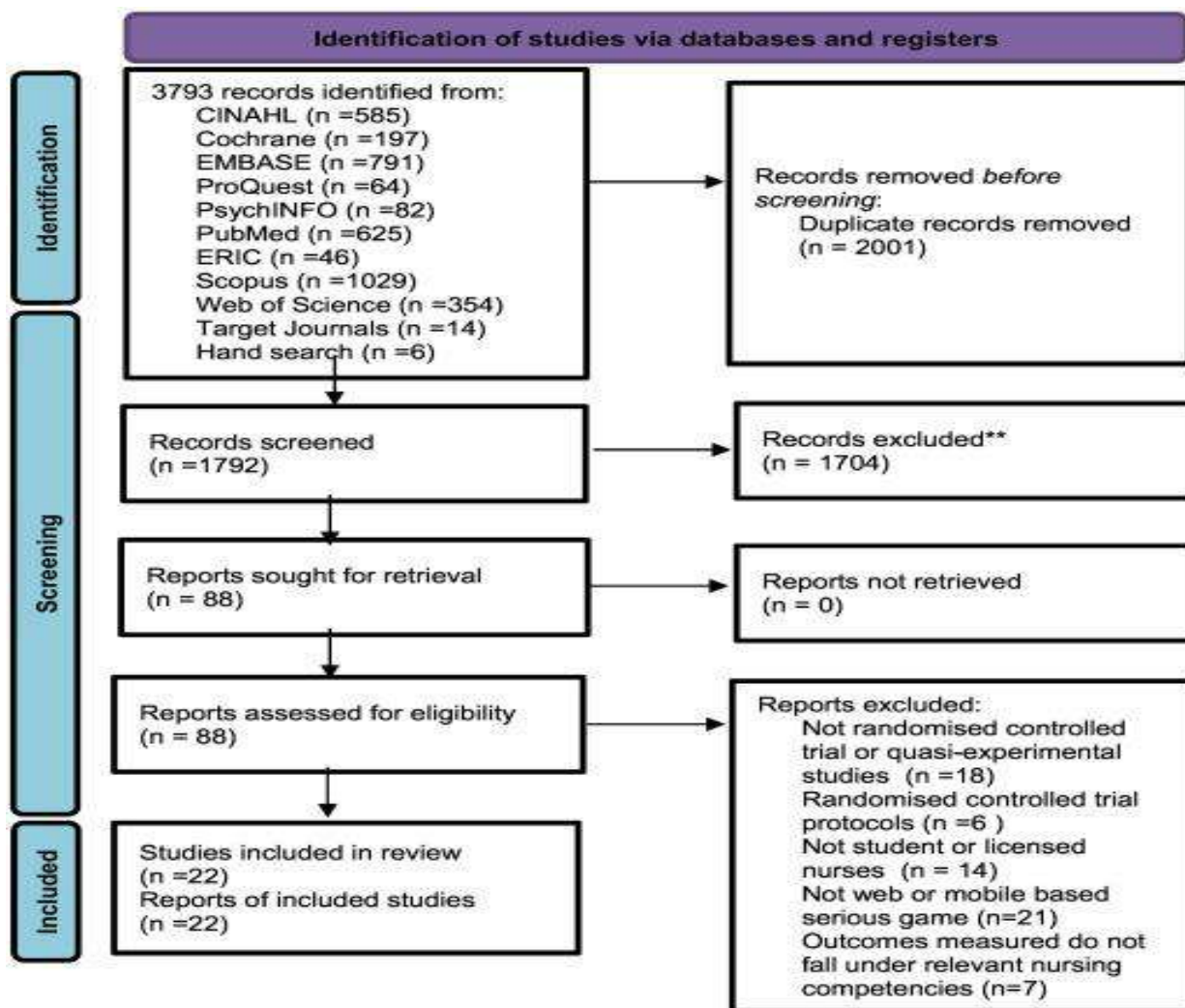5. Studies were published in English in a peer-reviewed journal.

2. Studies were excluded if the gaming intervention was not computer or mobile-based, did not include nurses or nursing students as the study sample, or was not published in English language within the years 2010 to 2021. Reports and conference proceedings were also excluded as the authors may not be able to appraise article quality.

納入條件

排除條件

p.2

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文獻納入的流程 PRISMA flow diagram

Identification of studies via databases and registers

3793 records identified from:
CINAHL (n =585)
Cochrane (n =197)
EMBASE (n =791)
ProQuest (n =64)
PsychINFO (n =82)
PubMed (n =625)
ERIC (n =46)
Scopus (n =1029)
Web of Science (n =354)
Target Journals (n =14)
Hand search (n =6)

Records removed *before screening*:
Duplicate records removed
(n = 2001)

Records screened
(n =1792)

Records excluded**
(n = 1704)

Reports sought for retrieval
(n = 88)

Reports not retrieved
(n = 0)

Reports assessed for eligibility
(n = 88)

Reports excluded:
Not randomised controlled trial or quasi-experimental studies (n =18)
Randomised controlled trial protocols (n =6)
Not student or licensed nurses (n = 14)
Not web or mobile based serious game (n=21)
Outcomes measured do not fall under relevant nursing competencies (n=7)

Studies included in review (n =22)
Reports of included studies (n =22)

閱讀標題及摘要後排除文章

排除重複的文章

66篇文章排除：
➢ **18篇:非隨機對照試驗或準試驗**
➢ **6篇:隨機對照試驗草案**
➢ **14篇:不是學生或執照護士**
➢ **21篇:不是嚴肅遊戲**
➢ **7篇:研究結果不符合**

A(Appraisal)---文獻是否經過嚴格評讀
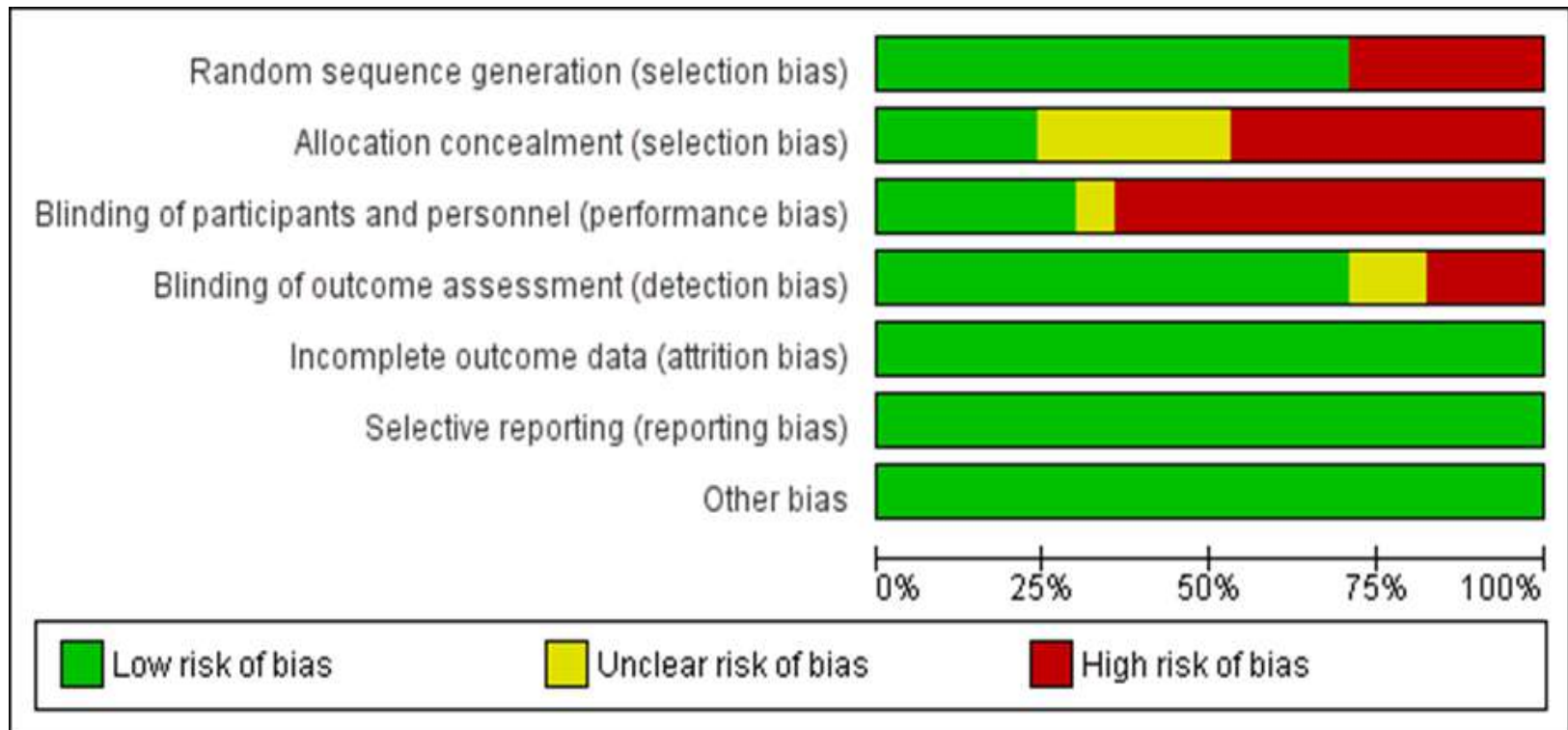
✔ **YES**

表三 列出納入的試驗研究的偏差風險

P.2-3

Risk of bias assessment
A risk assessment was conducted independently by DT and AT. The risk of bias graph and summary of 17 studies are displayed in Appendix C. Most studies reported participant randomisation. However, risk of selection and performance bias was high in an estimated 50% of the studies because of lack of allocation concealment and the inability to blind participants to the SG intervention. All studies reported full outcome data, and there were no other potential biases present. QETs

Quality appraisal
Risk of bias assessment was conducted using the Cochrane Collaboration's Risk of Bias tool (Higgins et al., 2011; Page et al., 2021). Studies were evaluated as low, unclear or high risk by the following criteria: random sequence generation and allocation concealment (selection bias), blinding of participants and personnel (performance bias), blinding of outcome assessment (detection bias), incomplete outcome data (attrition bias), selective reporting (reporting bias) and other potential biases. As our review also included one-group pre–post designs, the Joanna Briggs' Institute (JBI) Critical Appraisal Checklist for QuasiExperimental Studies (Tufanaru et al., 2017) was also utilised to assess the risk of bias. **A risk assessment was conducted independently by DT and AT.**

用ROB方式評讀工具，由DT和AT作者獨立進行嚴格評讀文獻的品質，但文章前面有提出有第三個作者，但未特別呈現說明，若有意見不一致時是否有第三者做協調或最後的結論

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I(Included)----是否只納入具有良好效度文章?

YES ✔

Risk of bias assessment

A risk assessment was conducted independently by DT and AT. The risk of bias graph and summary of 17 studies are displayed in Appendix C. Most studies reported participant randomisation. However, risk of selection and performance bias was high in an estimated 50% of the studies because of lack of allocation concealment and the inability to blind participants to the SG intervention. All studies reported full outcome data, and there were no other potential biases present. QETs

I(Included)----是否只納入具有良好效度文章?

Appendix C: Cochrane Risk of Bias summary and graph

納入文獻特徵(Table I)

Table 1
Study characteristics.

Author/year/country	Design	Aim	Participants	Intervention and comparator	Features of serious game	Findings (knowledge, skills, attitude/value)	Competency domain
Bayram and Caliskan, 2019 (Turkey)	RCT	To measure effectiveness of game-based virtual reality phone application on tracheostomy care education	86 nursing students $n = 43$(experimental) $n = 43$(control)	Virtual reality phone application Playtime: 10 min Comparator: Nil	Narrative scenario on tracheostomy Participant assumes first-person player of a nurse Non-player character guides player throughout Six stages of procedural steps of tracheostomy care	Knowledge: No difference between pre and post-test mean knowledge scores of both groups ($p = 0.568$) Skill: Post-test skill performance scores in experimental group significantly higher overall ($p = 0.017$), but not significant for aspect of inner cannula cleaning	Procedural skills
Blanie et al., 2020 (France)	RCT	Compare effectiveness of SG and traditional teaching method in improving clinical reasoning for detecting patient deterioration	146 nursing students $N = 73$ (intervention) $N = 73$ (control group)	Computer-based SG Comparator: paper-based case study and PowerPoint lecture	Free navigation in 3D environment Narrative scenarios on post-operative haemorrhage and brain trauma in elderly Interaction with virtual patient through scroll-down menu of predetermined options Access to patient file and ability to call virtual physician to present the case Three consecutive levels of progressing difficulty	Knowledge: Script concordance scores were not significantly different between groups immediately after intervention ($p = 0.43$) and one month post intervention ($p = 0.77$)	Clinical reasoning skills
Boada et al., 2015 (Spain)	RCT	Evaluate complementary CPR SG additionally to a mannequin-based training in undergraduate nursing students	109 nursing students $N = 42$ (simulation group) $N = 67$ (SG group)	Computer based SG and mannequin-based simulation training Comparator: mannequin-based simulation training	Participant takes role of helper in emergency virtual environment Incorrect actions and time delays are penalized through decreasing score and patient death Interface shows participant progress and actions taken	Skill: Significantly higher performance scores in SG group compared to mannequin trained group	Procedural skills
Brull et al., 2017 (USA)	QET	Explore effectiveness of didactic, online modules and gamification in teaching wound, pain and fall management	115 nursing students $n = 31$ (didactic) $n = 32$ (online module) $n = 52$ (gamification)	Computer-based gamification module (World of Salus) Comparator: didactic teaching Online modules	Avatar representation of player Virtual environment of jungles and coasts Various teaching strategies such as drag and drop, videos, matching, whiteboards Point reward system and leader board	Knowledge: Gamification group had significantly higher knowledge scores than other groups (effect size 0.26). Post hoc test demonstrate that gamification group had significantly higher scores than both the didactic and online module group in pain and fall knowledge	Management of nursing care

納入文獻特徵(Table I)

Table 1
Study characteristics.

Author/year/ country	Design	Aim	Participants	Intervention and comparator	Features of serious game	Findings (knowledge, skills, attitude/value)	Competency domain
Chang et al., 2020 (Taiwan)	RCT	Evaluate an ECG SG in enhancing students' learning motivation and performance	72 4th year nursing students $N = 36$ (experimental group) $N = 36$ (control group)	Computer based game Playtime: 120 min Comparator: traditional instruction	Story plot clinically related Scoring system through collecting 'gold coins' Hints provided during wrong moves	Knowledge: Experimental group performed significantly better than control group ($F = 22.08, p < 0.001$) Experimental group had higher critical thinking tendencies ($F = 629.76, p < 0.001$)	Clinical reasoning skills
Chee et al., 2019 (Singapore)	RCT	Evaluation of nurse-patient SG in teaching correct inhaler techniques	46 registered nurses $N = 23$ nurses (experimental group) $N = 23$ nurses (control group)	Computer based SG Comparator: usual teaching methods	Avatar representation of players Multiple minigames (puzzle matching, quizzes) Scoring system Immediate feedback	Skill: Experimental group demonstrated higher teaching performance score ($t = -2.76, p < 0.01$)	Procedural skills
Cook et al., 2012 (UK)	Pilot RCT	Evaluate impact of interactive web-based simulation game in life support training	32 undergraduate nursing students $N = 18$ (intervention group) $N = 16$ (control group)	Computer based simulation game Comparator: Nil	Five levels with progressing levels of difficulty Time challenge Scoring system Feedback according to players' decisions	Skill: No significant difference between both groups for ABCDE approach ($p = 0.642$) and chest compressions ($p = 0.64$) Intervention group scored significantly better in checking equipment ($p = 0.014$), airway assessment ($p = 0.03$) and safe use of defibrillator ($p = 0.048$)	Procedural skills
Del Blanco et al., 2017 (Spain)	RCT	Evaluating a videogame for nursing and medical students' visit to operating theatre (OT)	132 nursing and medical students $N = 62$ students (control group) $N = 70$ students (experimental group)	Computer based videogame Comparator: Nil	Mixed multimedia Includes virtual OT environment, common elements, scrubbed and non-scrubbed surgical personnel Feedback provided after game is completed	Attitude: Participants in intervention group demonstrated significantly positive effects in "perceived knowledge" ($p < 0.000$), "perceived errors committed" ($p = 0.017$) and "attitudes and behavior towards patients and staff" ($p = 0.018$) as compared to the control group. 'Fear to make mistakes' was not significant between groups ($p = 0.123$)	Management of nursing care
Farsi et al., 2021 (Iran)	RCT	Evaluating the difference in educating nursing students on CPR when using the traditional simulation training with a mannequin versus SG training on the smartphone	54 nursing students SG group ($n = 18$) Simulation group ($n = 18$) Control group ($n = 18$)	SG using a smart phone platform Comparator: Mannequin based simulation	Self-assessment and feedback after each completed task Unlimited tries in-game	Knowledge: No significant difference between the simulation intervention group and the SG group in knowledge posttest Shows how: For the skill posttest, the simulation and SG groups were significantly different from the	Procedural skills

納入文獻特徵(Table I)

Table 1
Study characteristics.

Author/year/ country	Design	Aim	Participants	Intervention and comparator	Features of serious game	Findings (knowledge, skills, attitude/value)	Competency domain
Foss et al., 2014 (Norway)	RCT	Examine if medication calculation game could improve examination results of nursing students	201 nursing students	Computer based online game Comparator: Nil	Three-part game (Training, self-testing, examination questions) Time challenges Scoring system Immediate feedback and collective point score upon completion	Knowledge: Participants in the intervention group who passed the examination played an average of 3.6times, while those who failed played 1.7times ($p = 0.009$) Average gaming score significantly higher for those who passed the examination ($p = 0.02$)	Procedural skills
Gutiérrez-Puertas et al., 2021 (Spain)	RCT	To design and develop a mobile application (app) to help nursing students acquire and retain knowledge about Basic and Advanced Life Support techniques	184 nursing students Experimental ($n = 92$) Control ($n = 92$)	Guess It (SVUAL) mobile app Playtime: 90 min Comparator: Nil	Time challenge Player who guesses more answers wins	Knowledge: Statistically significant differences were found between the experimental and control groups ($p < 0.05$) Statistically significant differences were observed between the retest (3 weeks later) results of the control and experimental groups ($p = 0.003$)	Procedural skills
Habes et al., 2020 (Netherlands)	One group pre-post test	Investigate the effect of Serioussoap.nl on geriatric knowledge of nursing students and nurses	119 nursing students, 77 first year nurses, 44 vocational nurses	Computer based interactive platform Comparator: Nil	Mixed multimedia of film clips Multiple-choice questions Storytelling based on real life situations	Knowledge: Significant increase of geriatric knowledge for paired group ($p = 0.002$)	Management of nursing care
Hwang and Chang, 2020 (Taiwan)	QET	Explore effectiveness of intravenous injection game	56 nursing students $N = 28$ experimental group and 28 students in control group	Computer based game, flipped learning approach Comparator: Video-based flipped learning	Mixed multimedia (images, videos) for learning resources Players must pass knowledge test in game to complete it	Knowledge: Experimental group had significantly higher knowledge scores than control group post-test ($t = 5.19, p < 0.001$)	Procedural skills
Jansen et al., 2018 (USA)	Pilot QET	Evaluate effectiveness of a SG in adherence to end-tidal carbon dioxide monitoring protocol	53 clinicians (nurses, respiratory therapists, physicians, nurse practitioner, physician assistant)	Computer based online game Comparator: Nil	Game environment resembled basketball court Players required to catch correct basketball (displaying correct answer) corresponding to the multiple-choice questions Players required to pass two game levels Point system	Knowledge: Significant improvement in post-test knowledge ($p = 0.03$) Skill: Statistically significant improvement in adherence to the protocol after intervention, even after 3 months	Quality improvement
Kang and Suh, 2018 (Korea)	QET	Evaluating a gamified chronic illness care smartphone application			Virtual environment Two storylines relating to	Knowledge: Significant difference in post-test hypertension	Management of nursing care

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Table 1 (continued)

Author/year/country	Design	Aim	Participants	Intervention and comparator	Features of serious game	Findings (knowledge, skills, attitude/value)	Competency domain
			92 students n = 49 (experimental) n = 43 (control group)	Smartphone application Comparator: Nil	caring for patients with hypertension and diabetes Scoring system based on players appropriate actions for patient care	knowledge (t = 4.41, p = 0.001) and diabetes knowledge (t = 2.45, p = 0.009) between experimental and control group	
Keys et al., 2020 (Canada)	Pilot RCT	To compare traditional pre-simulation preparation to a virtual simulation game in addition to traditional pre-simulation preparation during a resuscitation-oriented clinical simulation	20 nursing students Intervention group (n = 10) Control group (n = 10)	Computer-based game Playtime: 15 min Comparator: mannequin-based simulation	Players experience role of a nurse caring for a patient in cardiac arrest Can only advance in game after giving correct response Immediate feedback on incorrect responses	Skill: Overall performance scores were significantly greater for participants in the intervention group than for the control group (p = 0.003)	Procedural skills
Lemermeyer and Sadesky, 2016 (Canada)	One-group pre-post test	To evaluate the effect of a computer game on nurses' self-perceived knowledge on jurisprudence	69 registered nurses	Computer-based game Comparator: Nil	Interactive feedback (scoring, peer feedback) Progressing levels	Attitude: Self-perception of jurisprudence knowledge	Legal and ethical practice
Mitchell et al., 2021 (UK)	One group pre-post test	Evaluate the effect of a SG about influenza, on nursing student attitude, knowledge and uptake of the influenza vaccination.	124 first year nursing students	Computer-based game Comparator: Nil	Players receive feedback and further information on each question they answer in the game Leader board	Knowledge: Nursing students scored an average of 68.6% pre-intervention and 85.2% post-intervention, demonstrating a statistically significant increase (p < 0.001).	Management of nursing care
Oneill et al., 2018 (USA)	One group time series design	Evaluating a point of care intervention of nurses' knowledge of best practices for catheter-associated urinary tract infections	50 registered nurses (week 0–2) 37 registered nurses from first phase (week 2–8)	Mobile technology platform Comparator: Nil	Video vignettes and case studies Online quizzes which allow multiple attempts Dashboards with peer rankings	Knowledge: Statistically significant increase in knowledge from week 2 to week 8 (p = 0.02)	Quality improvement

納入文獻特徵(Table I)

Table 1
Study characteristics.

Author/year/country	Design	Aim	Participants	Intervention and comparator	Features of serious game	Findings (knowledge, skills, attitude/value)	Competency domain
Su, 2017 (Taiwan)	QET	To develop 3D medical simulation game and assess effectiveness on students' learning anxiety and motivation (3D cardiac catheterisation game-based learning)	102 nursing students $n = 34$ (intervention) $n = 34$ (control group 1) $n = 34$ (control group 2)	Computer based online game Playtime: 100 min in 1 week Comparator: Web-based e-learning, text-based learning	Five game levels Players must complete tasks to progress Virtual examination room, clinic and procedural room Participants adopt first person player Time challenges	Knowledge: Learning achievement of experimental group significantly higher than other control groups (F $= 21.33$, p < 0.001).	Management of nursing care
Tan et al., 2017 (Singapore)	RCT	Evaluate the effectiveness of a blood transfusion SG	103 s year nursing students $n = 57$ (intervention) $n = 46$ (control)	Computer based online game Playtime: 30 min Comparator: Nil	Three game stages Virtual hospital ward Participant takes on role of first-player role through avatar (staff nurse) Multiple mini games Feedback provided after each minigame Free navigation for sense of control	Knowledge: Significantly higher scores in knowledge (F $= -11.46$, $p < 0.001$) and confidence (F $= -9.04$, $p < 0.001$) in intervention group compared to control group Shows how: No difference in skill performance between both groups ($t = 1.64$, $p = 0.105$)	Procedural skills
Verkuyl et al., 2017 (Canada)	RCT	Compare virtual gaming simulation and laboratory simulation in paediatric knowledge, self-efficacy and satisfaction	47 nursing students n $= 23$(experimental) n $= 24$(control)	Computer based gaming simulation Playtime: 60–90 min Comparator: Mannequin-based simulation	Mixed reality in the computer game (video clips) Participant takes on first-player role Scoring system Feedback provided at each decision point	Knowledge: Only experimental group had significant improvement in knowledge ($t = -2.12$, $p = 0.045$)	Management of nursing care

3.3. Development of nursing competencies

The reviewed studies identified the application of SGs in the development of five core competencies: management of nursing care, clinical reasoning skills, procedural skills, quality improvement and legal practice. These core competencies were identified from referencing the domains of nursing competency by international standards and literature reviews (Cronenwett et al., 2007; Liu and Aungsuroch, 2018).

3.3.1. Management of nursing care

Seven studies applied SGs to develop nurses' abilities to provide holistic care in the delivery of nursing assessment, implementation and evaluation for clients with specific needs or specialised care. The areas of care covered by these SGs included fundamental care (e.g. fall, wound and pain management; Brull et al., 2017), chronic illness management (hypertension and diabetes; Kang and Suh, 2018), geriatric care (Habes et al., 2020), paediatric postoperative care (Verkuyl et al., 2017), cardiac catheterisation care (Su, 2017), influenza care (Mitchell et al., 2021) and exposure to the operating theatre setting (Del Blanco et al., 2017). Using a scenario-based approach, these SGs allowed players to assume the role of a nurse to perform holistic care involving nursing assessment, implementation and evaluation (Habes et al., 2020; Verkuyl et al., 2017).

3.3.2. Clinical reasoning skills

Two SGs were related to the application of decision-making and problem-solving skills in the interpretation of electrocardiograms (Chang et al., 2020) and detection of patient deterioration (Blanié et al., 2020). Chang et al. (2020) embedded gaming elements, such as challenges (e.g. finding problems in electrocardiogram clinical contexts and clinical decision-making) and storylines, to enhance the gaming fantasy and learners' curiosity. Blanié et al. (2020) immersed the players in a three-dimensional world and gave them identities through avatars to problem-solve patient deteriorating scenarios, also providing performance feedback and scoring.

3.3.3. Procedural skills

Ten studies described SGs in the context of developing nursing abilities in performing procedural skills. These procedural skills included intravenous injection (Hwang and Chang, 2020), tracheostomy care (Bayram and Caliskan, 2019), medication calculation (Foss et al., 2014), blood transfusion (Tan et al., 2017), inhaler techniques (Chee et al., 2019) and cardiopulmonary resuscitation techniques (Boada et al., 2015; Cook et al., 2012; Farsi et al., 2021; Gutiérrez-Puertas et al., 2021; Keys et al., 2020). In these SGs, the players were given the role as a nurse to perform multiple-level nursing procedures with time challenges, scoring systems or feedbacks (Chee et al., 2019; Cook et al., 2012; Farsi et al., 2021; Foss et al., 2014; Keys et al., 2020; Tan et al., 2017). Sensory stimuli through an interplay of acoustics, graphics and mixed multimedia of real-life video clips, pictures and graphics were incorporated to enhance players' visualization of the procedural skills (Bayram and Caliskan, 2019; Boada et al., 2015; Farsi et al., 2021; Keys et al., 2020).

3.3.4. Quality improvement

Two SGs were applied to improve nurses' abilities in quality improvement by enhancing their adherence to the hospital best practice guidelines or protocols (Jansen et al., 2018; Oneill et al., 2018). Oneill et al. (2018) involved the use of a mobile technology platform that enabled nurses to log into the portal to complete a structured handover for patients who had indwelling Foley catheters, and to complete catheter-associated urinary tract infection educational modules with the incorporation of quizzes, feedback and competition. Jansen et al. (2018) developed an SG computer game to educate on end-tidal carbon dioxide ($ETCO_2$) monitoring and interpretation.

3.3.5. Legal practice

Legal practice was considered by one study. This study investigated the use of a computer-based game in improving registered nurses' knowledge of jurisprudence, which incorporated elements such as scoring and ability to provide peer feedback, as well as progressive game levels (Lemermeyer and Sadesky, 2016).

T(Total up)作者是否以表格和圖表試驗結果？
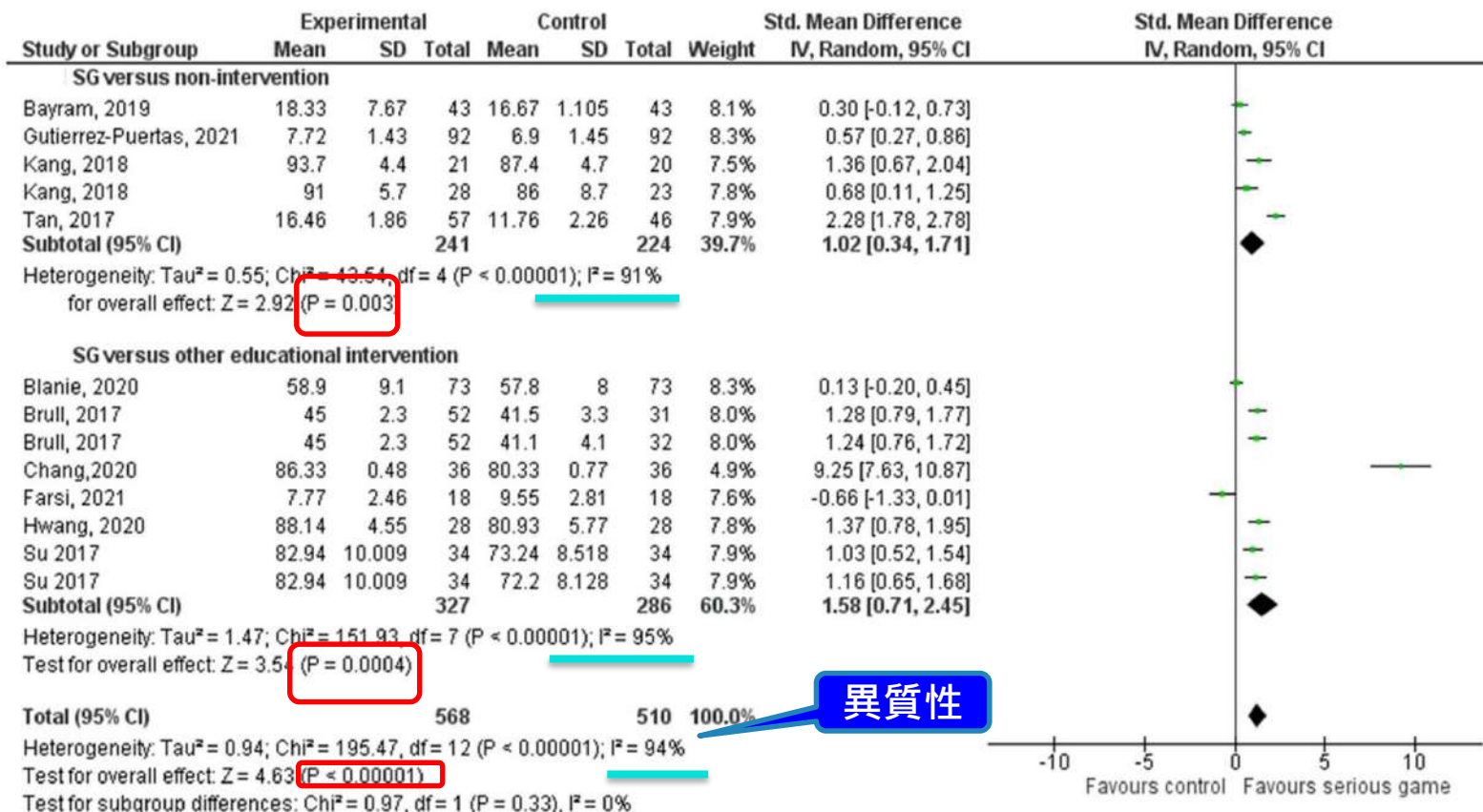# +H-(Heterogeneity)研究結果異質性是否相近？

Fig. 2. Meta-analysis of serious games on knowledge.

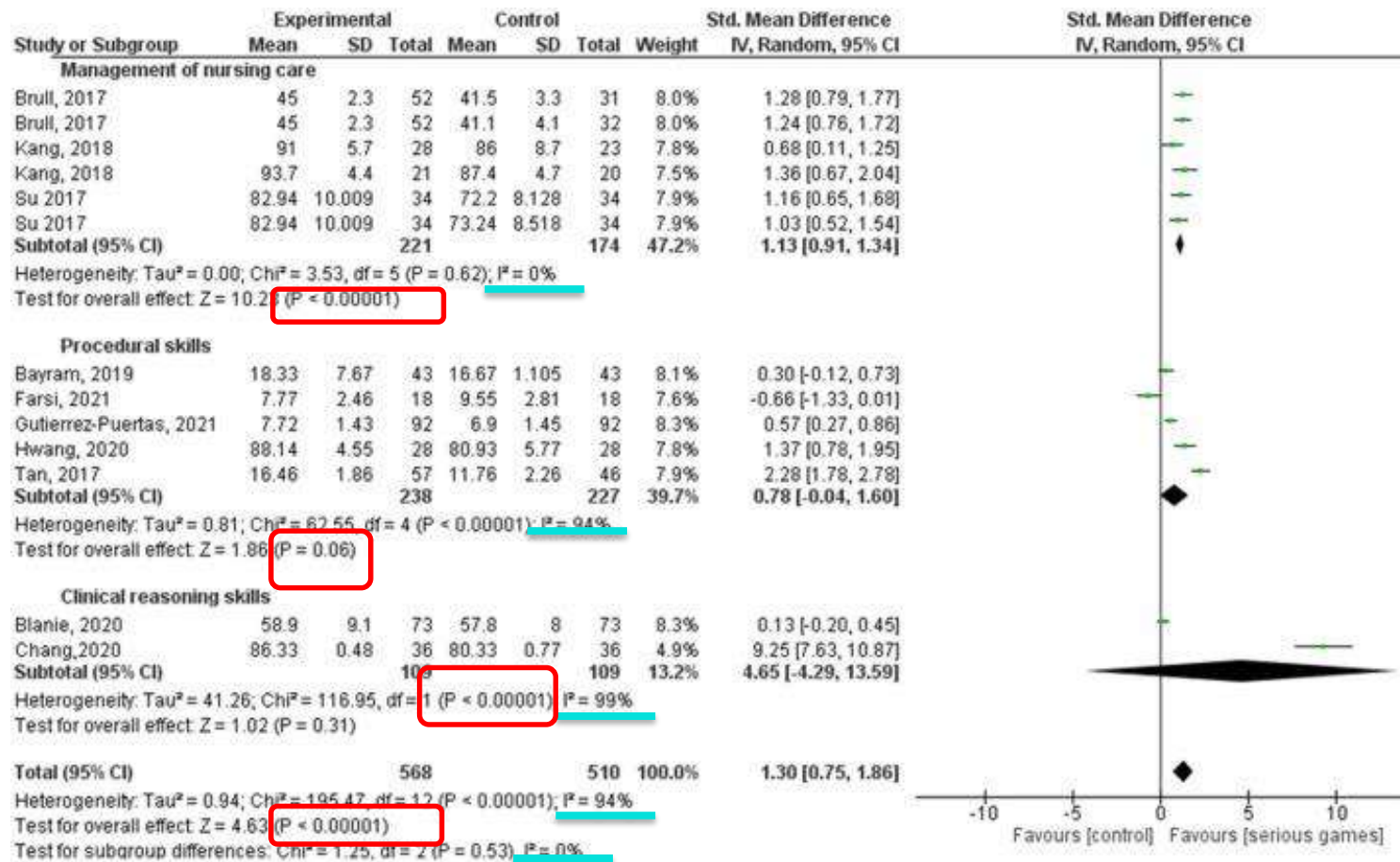# T(Total up)作者是否以表格和圖表試驗結果？
+H-(Heterogeneity)研究結果異質性是否相近？

Fig. 3. Subgroup analysis of knowledge outcomes across core competencies.
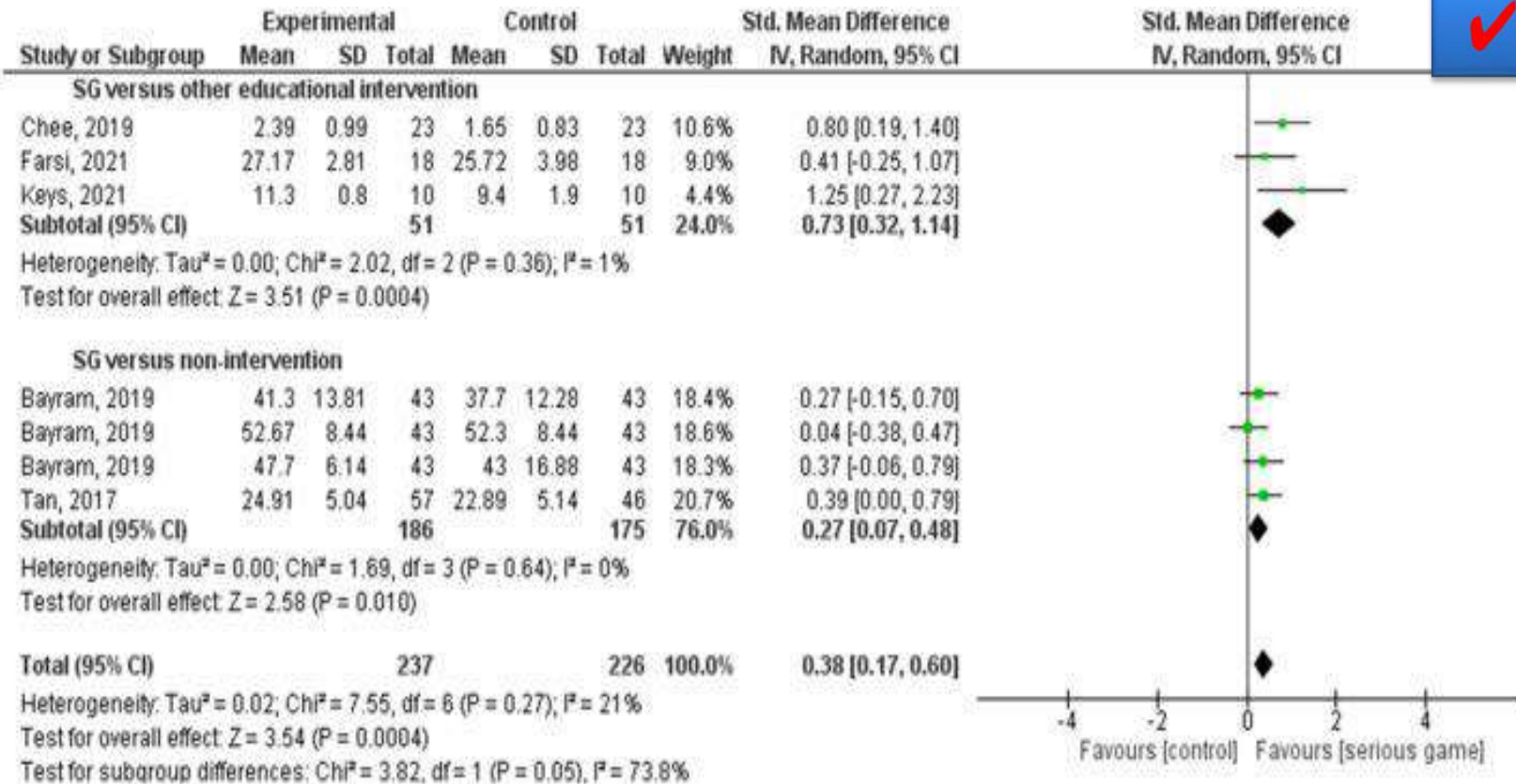
Fig. 4. Forest plot of skill outcome in serious games.

者的臨床技能表現，其中五項研究被納入薈萃分析。圖 4顯示了匯總的薈萃分析結果，該結果衡量了 SG 和比較組之間的臨床技能表現得分。由於 Bayram 的發現被分成三個數據集，因此有七個數據集。五項涉及 463 名參與者的臨床技能表現研究的總體匯總 SMD 顯著（SMD = 0.38, 95% CI [0.17, 0.60], $p < 0.001$），異質性低（$I^2 = 21\%$）。這提供了支持，即 SG 對模擬環境中技能績效的提高影響

綜整FAITH的結果

	Yes	No	Unclear
F	🔴		
A	🔴		
I	🔴		
T	🔴		
H	🔴		

限制

➢ Most of the reviewed studies were conducted on nursing students and focused mainly on short-term outcomes.

➢ Among the three studies conducted on registered nurses, two focused on the competency of quality improvement and one evaluated the effectiveness of an ETCO2 video game on hospital staff adherence to the hospital protocol.

➢ In congruence with our review, the limited research on SGs for continuing nursing education was also highlighted in an earlier review (Gong et al., 2019).

➢ Given the possible effect of SGs on nurses' workplace practice, more SGs could be developed to target them in continuing professional education, to keep their competencies up to date.

p.10

結論

➢ A review of 22 eligible studies demonstrated the application of SGs to develop nursing competencies in management of nursing care, clinical reasoning skills, clinical procedural skills and quality improvement.

➢ However, the risk of bias and heterogeneity of the included studies need to be taken into consideration.

➢ Our review concludes the following gaps should be filled to advance the use of SGs in nursing education.

(1)SGs to develop nursing competencies such as communication, teamwork and clinical reasoning should be developed and evaluated using appropriate tools.

(2)The effect of SGs on skills performance should be evaluated when used with mannequin-based simulation.

(3)The effect of gaming elements on nursing students and nurses' long-term learning acquisition and clinical practice outcomes needs to be evaluated.

p.10

結論

- More SGs are required to be incorporated into undergraduate and continuing nursing education for workplace training, with rigorous studies to examine the effect of SGs in developing and sustaining nursing competencies for the quality and safety of clinical practice.
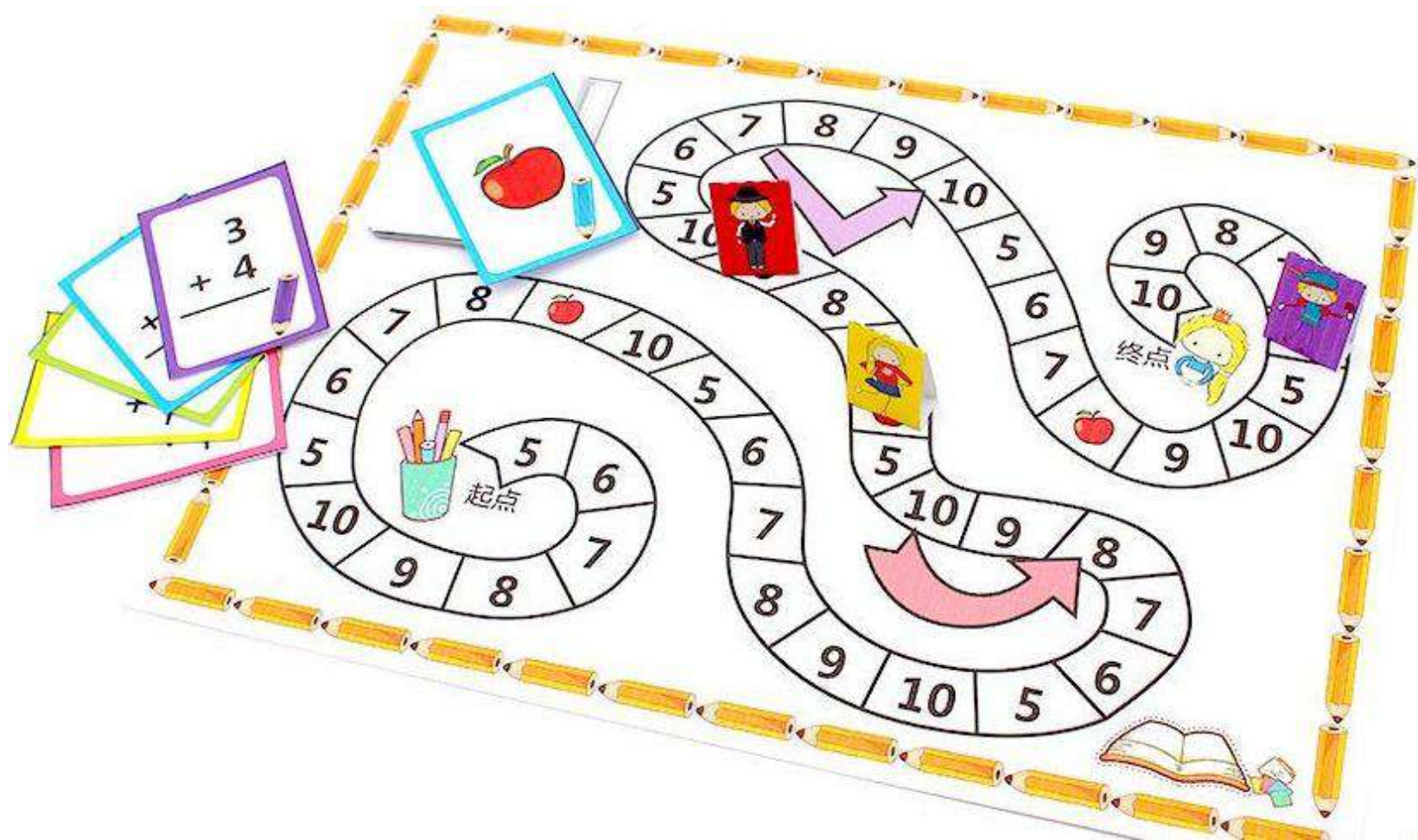
Q & A討論交流時間：

提問:贊不贊成將桌遊的教學方法納入，新進護理人員的教學課程模式對藥物認知的學習？

同意	10票
需要更多證據	22票
不同意	0票

謝謝聆聽