

Gamified Interprofessional Medical Education: A systematic review and psychological analysis

Ng Yui Hin¹, supervised by Fraide A. Ganotice²

¹ Department of Psychology, The University of Hong Kong, ² Bau Institute of Medical and Health Sciences Education, Li Ka Shing Faculty of Medicine, The University of Hong Kong



Introduction

The review investigates two main concepts in medical education: Gamification and interprofessional education. Interprofessional education refers to the interactive learning between professionals across different fields, where members of each group share and learn foreign concepts or knowledge from each other (van Diggele et al., 2020; Curran et al., 2010). When adopted in medical education, gamified interprofessional education (GIPE) provides a great opportunity for medical students to practice working with other professions (Krishnamurthy et al., 2022) and prepares them for the highly interdisciplinary nature of healthcare service and medical research (Karam et al., 2018).

Aim

By conducting a systematic review, we hoped to investigate 1) the overall effect of GIPE on the attainment of learning outcomes in medical education; 2) the novelty and quality of eligible studies, 3) the psychological and cognitive neuroscience evidence behind GIPE.

Methodology

This systematic review is registered on INPLASY (DOI: 10.37766/inplasy2024.9.0035). Literature searching was conducted using Scopus, PsychInfo, PubMed, CINAHL, EMBASE, ERIC, Web of Science and Medline. Keywords related to interprofessional education, gamification, medical education, university level studies, and education were combined. The selection criteria further include restrictions on source, year, study level, discipline, group size and the presence of gamification and medical education. Search results from each database were then exported to Covidence for screening. Abstract screening, full-text screening and data extraction were conducted independently by two reviewers. Quality for all eligible studies were assessed using the Medical Education Research Study Quality Instrument (MERSQI) and Modified-MERSQI (MMERSQI). Qualitative data were analyzed in RStudio and by Python scripts.

Search Strategy

("undergraduate" OR "postgraduate" OR "graduate") AND ("interprofessional" OR "interdisciplinary" OR "cross-disciplinary" OR "transdisciplinary" OR "multidisciplinary" OR "multiple professions" OR "multiple disciplines" OR "multiple programs" OR "different programs" OR "different professions") AND ("game" OR "gamified" OR "gamification" OR "game-based" OR "play-based" OR "simulation" OR "puzzles" OR "escape room" OR "virtual reality" OR "augmented reality") AND ("medical" OR "medicine" OR "healthcare" OR "health") AND ("education" OR "lessons" OR "learning" OR "course" OR "teach" OR "lecture" OR "activity" OR "experience")

Inclusion Criteria

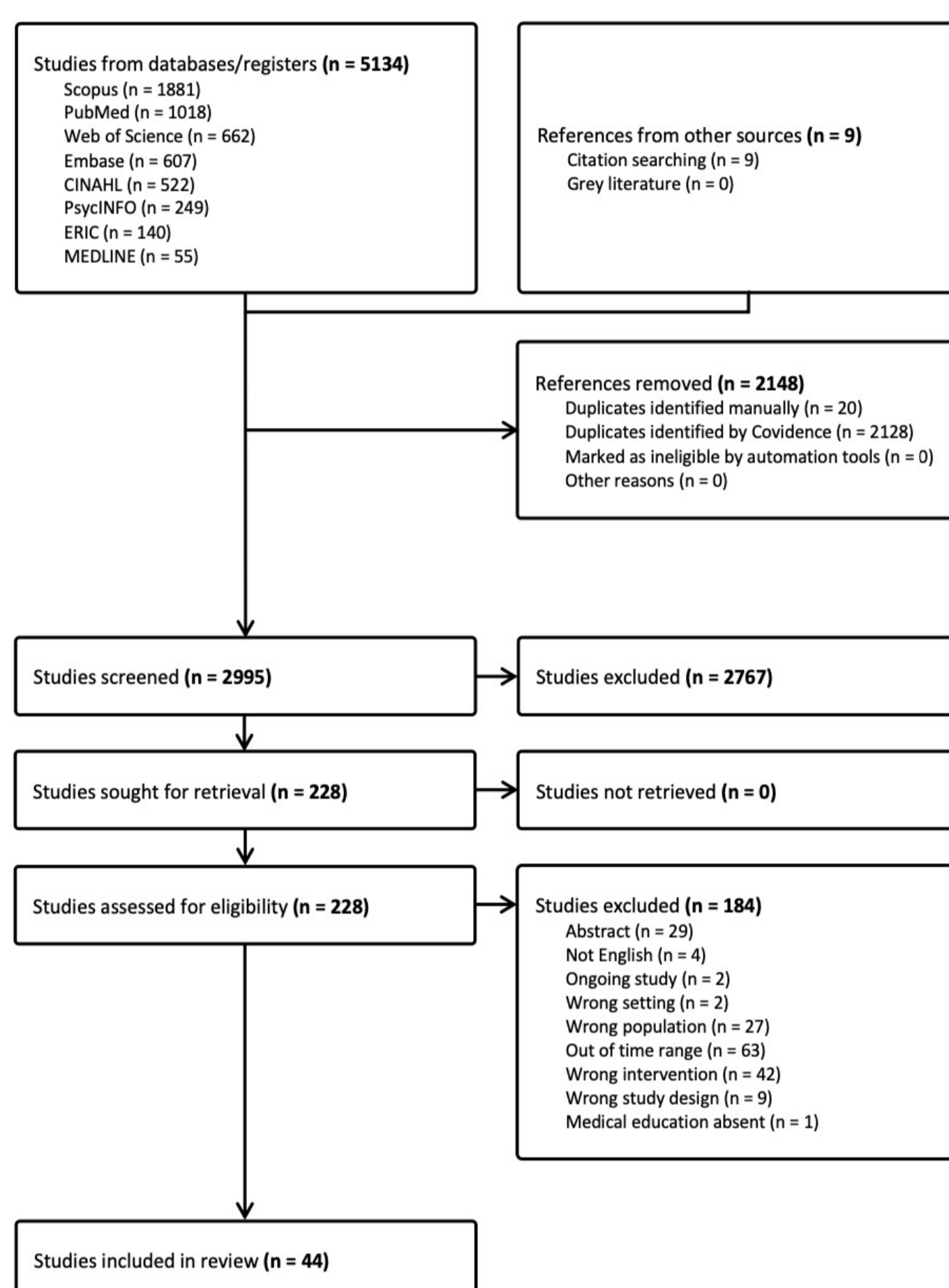
- Primary research published in a peer-reviewed journal between 2019 and 2024
- Involve medical education
- Involve interprofessional groups
- Involve game elements in the learning process
- Undergraduate or postgraduate students at the time of intervention
- Written in or officially translated into English

Exclusion Criteria

- Intervention effects or descriptive statistics were not reported
- The study was still ongoing
- The study was not published in full
- Details of the study interventions were not included

Results

5143 studies were identified from 8 electronic databases ($n = 5134$) and citation searching ($n = 9$). 2995 studies underwent abstract screening, and of them, 228 were deemed relevant and were screened in full-text. 44 eligible studies met inclusion criteria and were included.



Study Outcomes

All studies revealed at least one positive outcome (29 significant, $p < .05$), mainly focused on interprofessional competencies ($n = 44$) and knowledge or skill attainment ($n = 25$). Only 8 studies found negative results (none significant). Results from logistic regressions further revealed that the type of game element was not associated with significant study outcomes, rather, increasing study quality (MMERSQI scores) was significantly associated with an increase in the likelihood of significant outcomes ($OR = 1.15$, 95% $CI [1.03, 1.28]$, $p = .011$)

Logistic regression of the presence of significant outcomes on MMERSQI scores

Predicted variable	Predictor	Estimate	SE	z-value	p	OR
All significant outcomes	Intercept	-6.698	2.880	-2.326	0.020	0.001
	MMERSQI	0.139 ^a	0.055	2.532	0.011*	1.149
Model Fit Measures						AUC
Deviance	R^2_{McF}	AIC	χ^2	p		
47.982	0.150	51.982	8.482	0.004*	0.754	

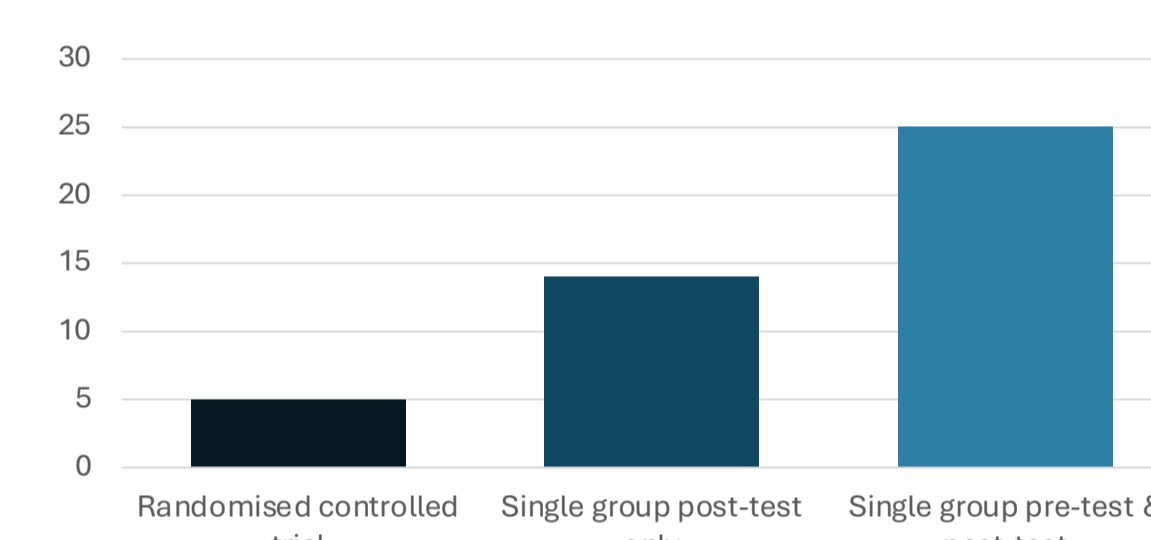
^a log odds of " All significant outcomes = Y" vs. " All significant outcomes = N"

Quality assessment

All included studies passed through quality assessment. The mean MMERSQI score was 54.41 out of 100 ($SD = 8.70$), while the mean MERSQI score was 10.39 out of 18 ($SD = 1.97$). Inventories were highly correlated ($r = .877$, $p < .001$), but the MMERSQI had significantly higher percentage scores ($M = 0.577$, $SD = 0.109$) than MMERSQI ($M = 0.544$, $SD = 0.087$; $t = -4.103$, $p < .001$, Cohen's $d = -0.619$)

Study Designs

Most studies had a single group pre-test & post-test design ($n = 25$), and only 5 were randomized controlled trials



GIPE elements and learning objectives

Most studies adopted role-play simulations ($n = 36$, 81.8%). The remaining were strategy games or escape rooms. Main game themes included emergency medicine, patient care, hospital safety and management, and other specialties. Outcomes were classified as interprofessional competency outcomes or knowledge and skill acquisition outcomes.

Game types and psychological analysis

This session is under review and has not yet been completed. Results will be provided by late October 2024

Discussion & Conclusion

- Preliminary analysis has found overwhelming significant positive evidence for the use of gamification in interprofessional medical education.
- Studies with a higher quality of evidence and more robust designs would be more likely to detect significant positive outcomes. However, high quality randomized controlled trials represent the minority of studies.
- The mean quality of our studies (MERSQI scores) was comparable to that of other studies on gamified medical education (van Gaalen et al, 2021).
- Game designs other than role-play simulations should be examined in the future.
- Future studies should adopt more randomized controlled designs.

References

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