

# The Role of Facilitation in a Diabetes Management Rehearsal Game on Cognitive Flow in Medical Education

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## Introduction

- There is a growing complexity of healthcare and the need for efficient methods to support continuous education of healthcare professionals. While digital interventions for diabetes education have become widespread, their focus is primarily on patients. There are thus gaps in interventions addressing the needs of caregivers and healthcare professionals, along with existing literature reviewing the matter.
- Serious games, designed for educational or therapeutic purposes rather than entertainment, are created for healthcare professionals and seek to bridge these gaps, having been shown to improve motivation and management skills in patients and caregivers. [1]
- The paper emphasizes the importance of human facilitators in the learning process. In the context of serious games, educators can facilitate active learning, help learners retain information better and provide individualised feedback. The concept of "flow" (a highly focused, enjoyable state of learning) is also discussed as a key element that can be fostered through human facilitation in serious games.

## Methods

- This mixed-methods, open-label, randomized controlled trial was conducted with clinical-year medical students from the Lee Kong Chian School of Medicine who have completed the endocrinology segment of their internal medicine posting.
- According to CONSORT guidelines, participants were randomized into either the facilitated intervention or facilitator-free control group (fig 1).
- In this app-based game (fig 2), the facilitator moderated difficulty, offered guidance on game controls, provided explanations and checked in on the players.
- Prior to the formal study, informal focus group discussions (FGD) were conducted prior to determine theoretical bases for the game intervention.
- For the game, players were first given a tutorial with actual gameplay, then spent 12 minutes playing the game.
- Post-gameplay, Flow Short Scale (FSS) scores [2] were collected and FGDs analysed players' perspectives on the game.
- Quantitative data from FSS and in-game scores were analyzed using t-tests, while qualitative data from FGD were subjected to inductive thematic analysis.

## Aims

- To explore the benefits of human-assisted facilitation in digital serious game-based interventions for the revision of diabetes management.
- Our hypothesis is that having a human facilitator will boost participants' focus and learning from the games, leading to higher aforementioned "flow" scores.

Fig 1: CONSORT flow diagram for participant allocation

Fig 2: Game overview

## Results

### Participant Demographics

53 clinical-year medical students from the Lee Kong Chian School of Medicine who have completed the endocrinology segment of their Internal Medicine posting were recruited and randomised into either facilitator-free control group (n=26) or facilitated intervention group (n=22) for the app-based game.

Fig 3: Participant Demographics

Characteristics	Control	Intervention
<b>Game randomized controlled trial</b>		
Total participants (n)	26	22
Male, n (%)	13 (50)	12 (54.5)
Female, n (%)	13 (50)	10 (45.5)
Age (years), mean (SD)	22.5 (1.36)	22.4 (0.91)
<b>Focus group discussions</b>		
Total participants (n)	10	8
Male, n (%)	5 (50)	5 (62.5)
Female, n (%)	5 (50)	3 (37.5)
Age (years), mean (SD)	21.7 (0.48)	22 (0.79)

### Comparison of FFS Between Control and Intervention Groups

In summary, FFS is significantly better in the intervention group compared to the control group:

Fig 4: Comparison of FFS Between Control and Intervention

Variables	Control, mean (SD)	Intervention, mean (SD)	t test (df)	P value	Effect size, Cohen's d
Overall flow	4.4 (0.8)	4.95 (0.85)	-2.17 (46)	.04	0.63
Fluency	4.03 (1.16)	4.52 (1.06)	-1.5 (46)	.14	0.44
Absorption	4.06 (0.83)	5.6 (0.87)	-2.6 (46)	.01	0.75
Importance	4.26 (1.39)	4.35 (1.31)	-0.2 (46)	.84	0.06
Mean hours of blood glucose	2.66 (1.36)	2.35 (1.09)	0.86 (46)	.4	NA <sup>a</sup>
Mean minutes	2.77 (1.88)	2.73 (1.67)	0.08 (46)	.94	NA
Number of excursions	1.58 (1.54)	0.64 (0.55)	2.07 (46)	.04	NA

- Intervention group had statistically significant superiority for overall flow ( $t_{46}=-2.17$ ,  $P=0.04$ ), primarily attributed to superiority in the absorption subdomain ( $t_4=-2.6$ ,  $P=0.01$ )
  - Absorption is notably high for the intervention group
- Intervention group had higher fluency (4.52 vs 4.03) and importance (4.35 vs 4.26), although these differences were not statistically significant ( $P=0.14$  and  $P=0.84$  respectively)
- Moderate to relatively high effect sizes for overall flow ( $d=0.63$ ) and absorption ( $d=0.75$ )

### Thematic Analysis (Focus Group Discussion)

#### Theme 1: Perceptions on Facilitation:

- Facilitated students felt a sense of safety and were more likely to undertake greater challenges: "Yeah, I think it was quite... it was sort of like a safety blanket, you know? I think I just felt like if anything happened I can go to the facilitator, like, hi, can you help? Can you take out one person? That would be like the guy over there." [Student 1A]
- Unfacilitated students experienced increased challenges. Performance deteriorated when the was too much for their skill levels, and desired facilitation when this occurred. "Okay, so it was challenging, but it was very frustrating, and I didn't know what I could do to resolve it." [Student 1C]
- "Yeah, I think a facilitator would have been good or at least there would be, like, instructions on the screen, lah." [Student 1C]

#### Theme 2: Perceptions on Support for SDT:

- Students who perceived themselves struggling with underperformance (actual or otherwise) requested additional modifications to the game beyond what the facilitator was capable of: "But yeah, it will be better if there's, like, a tutorial or something from the easy levels to high levels, like that, yeah." [Student 1C]
- Feelings of autonomy were noted to already be present due to the numerous means of resolving problems and that actions were free of true consequences: "But because I didn't feel like there was any serious consequence, because it was a game, so I thought it was quite fun." [Student 2D]
- Perceptions of relatedness were most prevalent during attempts to involve peers as fellow participants and included comparisons to popular cooperative recreational games: "So, instead of it being confined to just the cafeteria and the outdoor exercise area, we could have the opportunity to explore more places... I'm thinking like an Overcooked kind of thing, like, different islands." [Students 1A and 1B]

#### Theme 3: Perceptions of Support for Flow Theory:

- Facilitated students were more likely to experience an altered perception of time despite there being a clock in the game: "But it was a fun experience, I felt engaged, because every minute I would check everyone's [blood glucose]. So, I did not realize, like, that time had passed." [Student 2D]
- Students were retrospectively aware of becoming completely absorbed in the activity to the point of forgetting about the facilitator's presence, despite regular check-ins: "It's like I don't have the mental capacity to focus on anything else." [Student 3C]

#### Theme 4: Perceptions of Game Design Elements:

- Students generally perceived the game as fun, enjoyable and an appropriate means of revising diabetes management and knowledge. The intervention was perceived as both challenging and a safe space in which to commit mistakes humbly: "But because I didn't feel like there was any serious consequence, because it was a game, so I thought it was quite fun." [Student 2D]
- Students requested for changes, which primarily focused on being able to play the game with other people and meet the need for relatedness: "Like, you can play with a friend... Unless, I don't know, there's some multi-player function introduced." [Student 1A]
- Changes in line with flow theory focused on how the game should have better presented information to students: "Maybe at the start, before you start playing, that there's a screen that shows everybody with all their conditions." [Student 3E]

#### Additional Findings:

- Certain student characteristics exerted influence over the degree of engagement with the game and facilitator
- 1 student indicated altruistic motives: "I was pretty immersed in the game, and especially with the fact when the people started dying and getting hospitalized. I think, like, when... Once that's happening, then, yeah, like, oh, no, and then you feel more immersed in the game, because you want to keep everyone else alive." [Student 3E]
- Students who appeared more forgetful than their peers were more likely to express frustration that inhibits engagement: "...apparently the endocrinology emphasised that during multiple tutorials, but I don't have any recollection of that at all." [Student 3B]

## Discussion

- The study's results support the hypothesis that the facilitated group demonstrated higher flow scores than the control group. Focus group discussions revealed that participants felt a sense of safety and a greater willingness to take on challenges when facilitated, which were key factors in achieving flow.
- This suggests that facilitators helped align the participants with optimal conditions for flow, particularly for beginners or less confident players. This is supported by existing literature as well. [3]
- One limitation of this study is the inability to investigate the long term benefits of human facilitation in serious game-based interventions. As such for future studies, we would aim for it to be longitudinal in nature, so as to accurately assess the impact of a human facilitator on knowledge retention.

## References

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