

Research Article

# Improving Calorie and Muscular Endurance Knowledge through MiPlato FIT Flashcards among Collegiate Students

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**Abstract:** *More than half of screened Malaysians are overweight or obese, largely due to excessive calorie intake and insufficient physical activity. Many lack knowledge about food calorie content and suitable exercises for weight loss. The MiPlato FIT flashcards, an upgraded version of MiPlato, focus on healthy eating and balanced diets, aiming to improve nutrition education through interactive methods. Recognizing the critical role of food calorie intake and physical activity in energy balance, MiPlato FIT introduces a new feature: guidance on performing simple exercises to reduce calorie consumption. In response to the widespread lack of awareness about calorie counting and effective reduction methods, the game encourages participants to strategically place low-calorie food cards and prioritize physical activity cards indicating calorie expenditure. Moreover, participants engage in 30-second exercises with proper technique. Given Malaysia's high obesity rates in Asia, MiPlato FIT flashcards could enhance nutrition education and emphasize the importance of exercise in calorie reduction. Results show a significant increase ( $p < 0.05$ ) in participant knowledge of calorie counting for various food groups and exercise movements after engaging in the MiPlato FIT flashcard game. These findings suggest that MiPlato FIT is a highly effective tool for conveying information about calories and physical activity, promoting awareness of healthy eating habits and lifestyle choices.*

**Keywords:** *calorie; energy balance; flashcard; exercise*

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## 1. INTRODUCTION

The prevalence of overweight and obesity is increasing across Asia, with Malaysia leading the trend (Mohd-Sidik et al., 2021; Pawa Pitil & Raudzah Ghazali, 2022). The National Health and

Morbidity Survey (NHMS) conducted across Malaysia indicated an escalating trend in obesity rates, with percentages of 15.1%, 17.7%, and 19.9% observed in 2011, 2015, and 2019, respectively. Notably, the latest data indicate a prevalence of obesity among Malaysian adults at 20.1%. (Chong et al., 2019). Environmental factors, including lifestyle behaviours such as dietary choices and physical activity, are expected to be linked to obesity (Nordin et al., 2020). Efficient approaches are required to encourage nutritious eating habits that can reduce the risk factors linked to chronic illnesses.

Poor adherence to eating patterns has been reported to correlate with a lack of nutrition knowledge (Balani et al., 2019; Bonaccio et al., 2013). Klohe-Lehman et al., (2006) found that increased nutrition knowledge was linked to successful weight loss. Insufficient understanding of healthy eating patterns underscores the significance of nutrition education in enhancing knowledge about nutrition, improving dietary habits, and promoting the selection of healthier foods (Risti et al., 2021). It is hypothesized that information leading to increased knowledge and personal awareness can effectively stimulate willingness to adopt a more healthful lifestyle (Baghurst et al., 2016).

Key elements of nutrition education encompass healthy eating and a balanced diet. Consuming a well-rounded, nutritious diet should supply individuals with the appropriate amount of calories and essential nutrients necessary to uphold energy equilibrium. Energy balance entails the equilibrium between energy intake and expenditure, primarily through physical activity. Sustaining this balance necessitates adhering to a wholesome, balanced diet and lifestyle. Notably, an excessive caloric intake coupled with insufficient physical activity significantly contributes to the development of overweight or obesity in individuals (Jehan et al., 2020). Reducing caloric intake and increasing physical activity to create a negative energy balance is a common strategy employed in the treatment of obesity (Wiechert et al., 2021). Thus, understanding dietary calorie information and exercise is pivotal for enhancing nutrition education and expose to healthy lifestyle.

In the educational context, the enthusiasm for learning significantly influences the effectiveness of the learning dynamics. Learners demonstrating heightened interest in learning can enhance the overall teaching and learning experience (Magdalena et al., 2019). Therefore, leveraging well-designed learning activities, such as integrating games into the learning process, is anticipated to boost learners interest (Sung et al., 2012). Elevated levels of learning interest correlate with increased cognitive receptivity and knowledge acquisition among students. Flashcards emerge as effective tools promoting active engagement in learning and memorizing information (Fitriani et al., 2021; Wen et al., 2020). Engaging in flashcard activities improves comprehension by providing multisensory stimulation, incorporating verbal, visual, and auditory cues, which contribute to long-term memory retention (Le et al., 2023). Moreover, flashcards facilitate self-regulated study practices, fostering optimal learning environments (Zung et al., 2022). Although flashcards serve as a technique and tool for memorization, maintaining motivation presents a significant hurdle to advancing in the learning process (Tuite et al., 2012). While previous research has explored flashcards in nutrition education (Bryson, 2012; Yuliana et al., 2023) their application specifically for calorie-related and exercise information remains unexplored.

Integrating the flashcard concept into a game-based format, the MiPlato FIT flashcards game aspires to function as an innovative tool for nutrition education, filling a void in current research pursuits. The MiPlato FIT flashcards game represent an upgraded version of the original MiPlato, emphasizing healthy eating and balanced diets. This educational game aims to enhance nutrition education through interactive methods. Recognizing that food calorie intake and physical activity profoundly impact energy balance, this upgraded version introduces a novel element: guidance on performing simple exercises to reduce calorie consumption. Given the prevalent lack of awareness about calorie counting and effective calorie reduction methods, the game prompts participants to

strategically place low-calorie food cards and priorities physical activity cards indicating calorie expenditure. Additionally, participants engage in 30 seconds exercises with the correct technique. Given Malaysia's elevated obesity rates in Asia, utilizing MiPlato FIT flashcards could potentially enhance nutrition education and promoting the significance of exercise in calorie reduction.

## **2. METHOD & MATERIAL**

### *2.1 Participants*

Forty-two diploma students enrolled in the Faculty of Sports Science and Recreation at UiTM Kampus Seremban, with a mean age of  $19.4 \pm 1.2$  years old, participated in the study. All participants were at the same academic level and attended the same class.

### *2.2 Materials*

MiPlato FIT flashcard is an interactive game wherein participants strategically select food cards from various nutrient groups, aiming to minimize calorie content. Each card is distinguished by specific colors representing distinct nutrient groups, accompanied by corresponding calorie-related information. Additionally, the "FIT" feature introduces power cards comprising a range of muscular endurance exercises, enhancing both enjoyment and challenges. These power cards serve as strategic options for players when lacking relevant food cards, thereby prolonging gameplay by avoiding additional card acquisition. However, employing a power card incurs a penalty, necessitating the next player to perform the associated workout.

### *2.3 Procedure*

The study employed an experimental methodology, involving participants in an interactive game using MiPlato FIT flashcards. The intervention sessions were routinely scheduled at the same time each day. Assessments were administered before and after the intervention sessions to evaluate the participants' understanding of calorie counting and exercise. The study sought to evaluate the influence of the interactive game on participants' understanding of nutrition and exercise. The study aimed to gain insights into the efficacy of employing gamification approaches to encourage better lifestyles among participants, using structured intervention and assessment procedures.

To commence the game, the dealer shuffles the cards and deals seven cards to each player. The remaining cards are positioned face down to create a draw pile. Initiating play involves revealing the top card from the draw pile. Players must then place a card of the same colour (representing the same food group) or a card with a lower calorie content than the top card. If such cards are unavailable, players can utilize physical activity cards or power cards. Physical activity cards, which specify calorie expenditure, hold precedence over other cards, featuring exercises like skipping, biceps curl, push-up, and squat, executed with proper technique. When played, the next player is obliged to perform the designated exercise for 30 seconds. Power cards can be strategically employed at any time, enabling an attack on the next player by drawing up to six cards from the draw pile. Additionally, a power card allows a player to alter the food group. In the absence of matching cards or power cards, players must draw from the pile until a suitable card is acquired. The first player to successfully eliminate all their cards emerges as the winner.

### 2.3 Statistical Analysis

The Statistical Package for the Social Sciences (SPSS) was utilized for all statistical analyses conducted in this study. Analysis of the data involved employing a paired sample t-test, with a predetermined level of statistical significance set at  $p < 0.05$ . Results were presented in terms of means accompanied by their respective standard deviations.

### 3. FINDINGS

The utilization of the MiPlato FIT flashcards game has demonstrated a notable enhancement in both calorie counting assessment scores and muscular endurance performance from pre- to post-tests, as depicted in Table 1, showcasing the outcomes of this study.

**Table 1.** Paired Sample Test Result on Calorie Counting and Cardiovascular Assessment

Variables	Pre-Data (Mean ± SD)	Post-Data (Mean ± SD)	t Value	Sig. (2-tailed)
Calorie Counting	25.6 ± 2.5	27.3 ± 2.4	-9.11	0.001*
Push-up	20.2 ± 4.5	26.2 ± 5.4	-12.58	0.001*
Sit-Up	30.5 ± 1.7	35.8 ± 2.6	-17.67	0.001*
Squats	2.03 ± 1.9	22.5 ± 1.7	-5.22	0.001*
Lunges	14.0 ± 2.0	15.2 ± 3.1	-4.04	0.001*

\* $p < 0.05$

The analysis of assessment scores from both the pre-test and post-test phases revealed significant improvements in calorie counting knowledge due to the implementation of the MiPlatoPlus flashcard game ( $p < 0.05$ ).

### 4. DISCUSSION

After the implementation of MiPlato FIT, it was observed that there was a noteworthy enhancement in the knowledge of counting calories and the level of exercise ( $p < 0.05$ ). These findings underscore the effectiveness of the nutritional flashcard game as an interactive learning tool for factual knowledge, such as food calories. Displaying information through both images and text on the card enhances players' understanding and absorption of the intended message and concept conveyed by the MiPlato FIT flashcard. Flashcard-based learning improves memory retention by engaging the brain through visual and auditory stimuli. Rapid presentation of the cards prompts the brain to quickly process and retain the information, thereby enhancing brain connectivity and facilitating the formation of long-lasting memories (Le et al., 2023).

According to Chien (2015), the MiPlato FIT flashcard game adopts an interactive learning approach that necessitates active participation among students with their peers for effective learning outcomes. Engaging in such social activities enhances memory experiences, thereby facilitating nutrition instruction. Integrating enjoyable activities into education enhances the appeal and efficiency of the learning process. Many theories suggest that positive learning experiences improve knowledge transmission outcomes. The addition of a new exercise element in MiPlato FIT heightens players' interest, introducing a novel aspect to the game. This inclusion prompts increased engagement and

participation among players, enriching the overall experience and enhancing the effectiveness of the game in promoting physical activity and health awareness. (Suaib et al., 2017).

The findings of this study suggest that the MiPlato FIT flashcard is a highly effective instructional tool for conveying information about calories and activity. It also promotes awareness of healthy eating habits and lifestyle choices. Therefore, it is strongly recommended for use.

## 5. CONCLUSION

Many research endeavours have utilized flashcards as a means of imparting knowledge in nutrition education, predominantly emphasizing nutrient information rather than calorie and exercise details. MiPlato FIT flashcards offer a game-based learning approach designed to assist individuals in understanding calorie counting and introduce simple exercises. Access to dietary calorie and exercise information is crucial for enhancing nutrition awareness. Game-based learning initiatives have the potential to disseminate awareness across diverse populations, fostering a deeper comprehension of healthy lifestyles.

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